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For related information see also *Astronautics*.

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90 ASTROPHYSICS **1740**
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION **1740**
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS **1741**
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION **1742**
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL **1742**

Note: N.A. means that no abstracts were assigned to this category for this issue.

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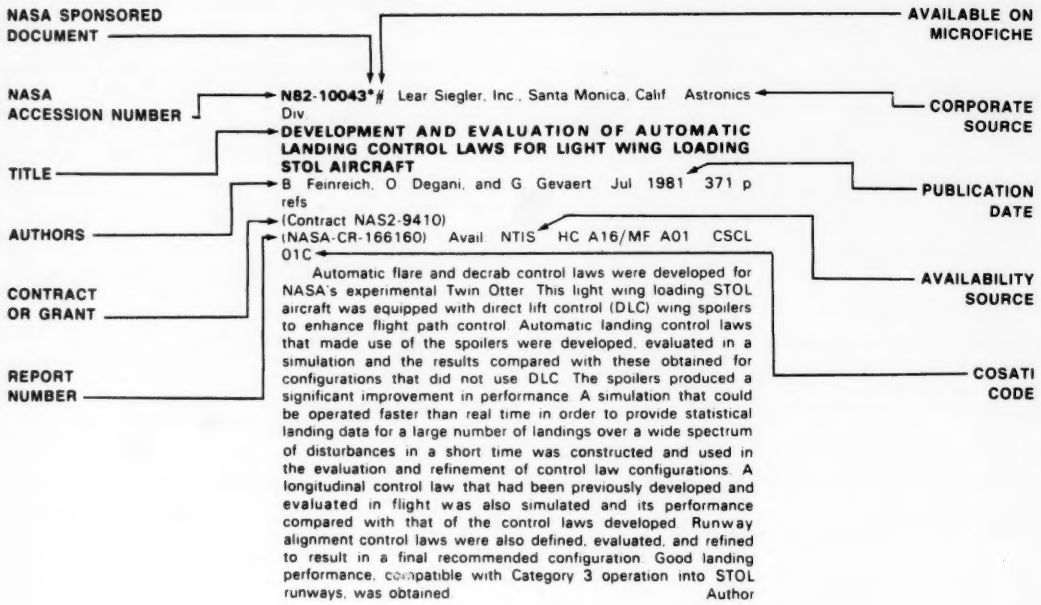
TYPICAL CITATION AND ABSTRACT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NASA ACCESSION NUMBER
N82-10043*# Lear Siegler, Inc., Santa Monica, Calif. Astronics Div.
CORPORATE SOURCE
TITLE
DEVELOPMENT AND EVALUATION OF AUTOMATIC LANDING CONTROL LAWS FOR LIGHT WING LOADING STOL AIRCRAFT
PUBLICATION DATE
AUTHORS
B. Feinreich, O. Degani, and G. Gevaert Jul. 1981 371 p refs
CONTRACT OR GRANT
(Contract NAS2-9410)
AVAILABILITY SOURCE
REPORT NUMBER
(NASA-CR-166160) Avail: NTIS HC A16/MF A01 CSCL 01C
COSATI CODE
Automatic flare and decrab control laws were developed for NASA's experimental Twin Otter. This light wing loading STOL aircraft was equipped with direct lift control (DLC) wing spoilers to enhance flight path control. Automatic landing control laws that made use of the spoilers were developed, evaluated in a simulation and the results compared with these obtained for configurations that did not use DLC. The spoilers produced a significant improvement in performance. A simulation that could be operated faster than real time in order to provide statistical landing data for a large number of landings over a wide spectrum of disturbances in a short time was constructed and used in the evaluation and refinement of control law configurations. A longitudinal control law that had been previously developed and evaluated in flight was also simulated and its performance compared with that of the control laws developed. Runway alignment control laws were also defined, evaluated, and refined to result in a final recommended configuration. Good landing performance, compatible with Category 3 operation into STOL runways, was obtained. Author

VOLUME 20 NUMBER 12 JUNE 23, 1982

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N82-21138* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING. A CONTINUING BIBLIOGRAPHY WITH INDEXES
Feb. 1982 100 p
(NASA-SP-7037(145); NAS 1.21:7037(145)) Avail: NTIS HC $5.00 CSCL 01A

This bibliography lists 326 reports, articles, and other documents introduced into the NASA scientific and technical information system in January 1982. Topics on aeronautical engineering and aerodynamics such as flight control systems, avionics, computer programs, computational fluid dynamics and composite structures are covered. R.J.F.

N82-21139*# National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala.
PROCEEDINGS: FIFTH ANNUAL WORKSHOP ON METEOROLOGICAL AND ENVIRONMENTAL INPUTS TO AVIATION SYSTEMS
Dennis W. Camp, ed., Walter Frost, ed. (Tennessee Univ. Space Inst.), and Pamela D. Parsley, ed. Dec. 1981 149 p refs Workshop held at Tullahoma, Tenn., 30 Mar. - 1 Apr. 1981; sponsored by NASA, NOAA and FAA
(Contract NAS8-32692)
(NASA-CP-2192; NAS 1.55:2192; FAA-RD-81-67) Avail: NTIS HC A07/MF A01 CSCL 01B

Aviation safety, meteorology, air traffic control, training, flight operations, general aviation, and aviation weather research and services were examined in an effort to expand understanding and knowledge of the interaction of the atmosphere with aviation systems, better define and implement services to operators, and to collect and interpret data for establishing operational criteria relating the total meteorological inputs from the atmospheric sciences to the needs of aviation communities. For individual titles, see N82-21140 through N82-21152.

N82-21140*# Federal Aviation Administration, Washington, D.C. Energy Div.
METEOROLOGICAL IMPACT ON AVIATION FUEL EFFICIENCY **c05**
David E. Winer and John E. Wesler *In* NASA. Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Dec. 1981 p 15-19 refs (For primary document see N82-21139 12-01)
Avail: NTIS HC A07/MF A01 CSCL 01C

The connection between fuel consumption and weather data is discussed. Fuel efficient flights creating adequate near real time weather information are examined. The lack of highly resolved real time and near real time wind and temperature data at flight altitudes is investigated. The existing systems, which is based on twice a day balloon observations, supplemented by pilot reports or other occasional data, is not adequate for optimum flight planning. The impacts of upper winds and temperatures on fuel efficiency and flight planning are not widely appreciated and developing new weather products are considered. E.A.K.

N82-21141*# McDonnell-Douglas Electronics Co., St. Charles, Mo.
METEOROLOGICAL INPUTS TO ADVANCED SIMULATORS **c09**
Gordon O. Handberg *In* NASA. Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Dec. 1981 p 21-25 refs (For primary document see N82-21139 12-01)
Avail: NTIS HC A07/MF A01 CSCL 14B

Weather simulation as it is currently implemented and some suggestions and questions considered in future simulator developments are described. Flight simulators represent weather in a considerably broader sense and with an almost limitless capability for future expansion. Realistic weather is important in pilot training simulators. It offers promising opportunity to provide training because it permits an element of environmental control not available in the real world. E.A.K.

N82-21142*# USAir, Pittsburgh, Pa.
OPERATIONAL PROCEDURES RELATIVE TO SEVERE WEATHER **c03**
James F. Sullivan *In* NASA. Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Dec. 1981 p 26-28 (For primary document see N82-21139 12-01)
Avail: NTIS HC A07/MF A01 CSCL 01C

Severe weather impact on both safety and the economics of all types of aviation, and reduction of elimination are discussed. The functions and responsibilities of the dispatcher are outlined. All surface weather reports showing inclement weather, SIGMET REPORTS, forecasting turbulence or icing, convective SIGMETS: (1) tornadoes; (2) hail 3/4 of an inch or greater; (3) imbedded thunderstorms; (4) squall lines or (5) an area of level four or greater thunderstorms. This information along with PIREPs of severe weather are relayed to affected flights. It is concluded that operational procedures must be timely and well conceived to assure the least amount of impact on airline operations. E.A.K.

N82-21143*# National Aeronautics and Space Administration, Langley Research Center, Hampton, Va.
METEOROLOGY IMPACT ON FUTURE AIRCRAFT DESIGN **c05**
Joseph W. Stickle *In* NASA. Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Dec. 1981 p 29-34 (For primary document see N82-21139 12-01)
Avail: NTIS HC A07/MF A01 CSCL 01C

Meteorology impact on future aircraft design is discussed. Upcoming changes in both design and operations that will be influenced by the meteorological environment are outlined. Future and more nonconventional designs and meteorological impact brought about by operational changes over the next few years are examined. E.A.K.

N82-21144*# Federal Aviation Administration, Washington, D.C. Systems Research and Development Div.

METEOROLOGY IMPACT ON ATC SYSTEM DESIGN c04

Frank E. VanDemark *In* NASA. Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Dec. 1981 p 35-39 (For primary document see N82-21139 12-01)

Avail: NTIS HC A07/MF A01 CSCL 17G

The impact of meteorology on air traffic control (ATC) system design for designs, and for cost benefit evaluations is discussed. The myriad of choices for implementation is a problem of great magnitude, given the economic climate of today. Cost versus benefit requires greater emphasis. Expanding and improving weather data acquisition, increasing the speed of weather data transmission and automating those actions that lend themselves to standardization for automated data processing are outlined. Three programs are mentioned: (1) automated weather observations, (2) weather radar and improvements to the national airspace system as related to the handling of weather data; and (3) products. E.A.K.

N82-21145*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

OZONE AND AIRCRAFT OPERATIONS c46

Porter J. Perkins *In* NASA. Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Dec. 1981 p 40-44 refs (For primary document see N82-21139 12-01)

Avail: NTIS HC A07/MF A01 CSCL 04A

The cabin ozone problem is discussed. Cabin ozone in terms of health effects, the characteristics of ozone encounters by aircraft, a brief history of studies to define the problem, corrective actions taken, and possible future courses of action are examined. It is suggested that such actions include avoiding high ozone concentrations by applying ozone forecasting in flight planning procedures. E.A.K.

N82-21146*# National Aeronautics and Space Administration, Washington, D. C.

NASA RESEARCH PROGRAMS RESPONDING TO WORKSHOP RECOMMENDATIONS

A. Richard Tobiason *In* NASA. Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Dec. 1981 p 58 (For primary document see N82-21139 12-01)

Avail: NTIS HC A07/MF A01 CSCL 01B

The atmospheric electricity and lightning committee forecasts lightning and dissemination of information on the probability of occurrence. A data source with the F-106 flight program was established. The objective is to improve the detectability of lightning and severe storms and help develop operational avoidance procedures and to study the use of satellite and Doppler radar to detect thunderstorms and forecast the probability of lightning. Three recommendations are made: (1) to establish a national flying lightning laboratory; (2) strike models are considered and to gather strike data; (3) to find the best way to apply electrical field data to operations. E.A.K.

N82-21147*# Naval Research Lab., Washington, D. C.

PROGRESS ON LOW ALTITUDE CLOUD ICING RESEARCH c47

Richard K. Jeck *In* NASA. Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Dec. 1981 p 59-63 refs Prepared in cooperation with Naval Academy (For primary document see N82-21139 12-01)

Avail: NTIS HC A07/MF A01 CSCL 04B

The icing environment at altitudes below 10,000 feet were studied. The following questions are asked, are: (1) existing aircraft certification criteria applicable; (2) too stringent on icing for helos; (3) based on accurate data; (4) appropriate for low (10,000 ft) altitudes? The research plan is outlined: review historical icing data, obtain new measurements, collect modern icing data from other groups, and recommend LWC, OAT, and MVD criteria for helicopters. Estimated accuracies and known sources of error are included. It is concluded that the net effect of possible sources of error of both signs is uncertain. E.A.K.

N82-21148*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NASA/LEWIS RESEARCH CENTER ICING RESEARCH PROGRAM c03

Peggy L. Evanich *In* NASA. Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Dec. 1981 p 64-75 (For primary document see N82-21139 12-01)

Avail: NTIS HC A07/MF A01 CSCL 01C

Icing requirements for commercial aircraft, light transport and general aviation aircraft, and rotorcraft were studied. The objectives was to: establish the state of the art in aircraft icing, determining the aircraft industry's icing research and technology needs, and recommending both short and long term icing programs to NASA. It is shown that all three categories of aircraft need improved and new ice protection system, icing calculational techniques, icing performance sensitivity on current and modern airfoils, and new and improved icing facilities. The need for a general aviation pilot training film concerning flight into icing conditions is also identified. E.A.K.

N82-21149*# Dayton Univ., Ohio.

EFFECT OF HEAVY RAIN ON AIRCRAFT c05

James K. Luers *In* NASA. Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Dec. 1981 76-80 (For primary document see N82-21139 12-01)

Avail: NTIS HC A07/MF A01 CSCL 01C

A summary on heavy rain effects on aircraft aerodynamics validation of research and some wind shear accidents in which heavy rain were an important factor. Frost formation and what frost does to the lift and drag curves for an airfoil was examined. If frost could cause severe aerodynamic problems for both general aviation and transport aircraft due to its roughness, then heavy rain produce a similar result. The influencing parameters of heavy rain on an aircraft are studied. Sources of aerodynamic roughness due to rain and wind shear and heavy rain accidents are outlined. E.A.K.

N82-21150*# Federal Aviation Administration, Washington, D.C.

PROTOTYPE REGIONAL OBSERVATION AND FORECAST SYSTEM (PROFS) c47

John W. Hinkelman, Jr. *In* NASA. Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Dec. 1981 p 81-85 (For primary document see N82-21139 12-01)

Avail: NTIS HC A07/MF A01 CSCL 04B

The prototype regional observation and forecast system (PROFS) outputs are demonstrated, functional design specifications to be used to procure and implement operational systems are outlined. Advanced candidate technologies are evaluated as an integral part of the process that leads to these outputs. Evaluation insures that future weather service systems will contain the optimum mix of technologies to be most cost effective in reducing the annual losses and deaths that are directly attributed to severe weather. E.A.K.

N82-21151*# Control Data Corp., Minneapolis, Minn.

CABIN OZONE AND TROPOPAUSE DEFINITION c54

Arthur D. Belmont *In* NASA. Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Dec. 1981 p 86-89 ref (For primary document see N82-21139 12-01)

Avail: NTIS HC A07/MF A01 CSCL 06K

A method to estimate ozone profiles is based on knowing the total ozone which may come from any observational system available such as Dobson photometers that are available from NMC forecasts and used operationally in flight planning. From this an ozone profile at selected pressure levels is obtained. The technique was based on five years of ozonesonde data. So far, models have been developed for winter, spring, and fall. A.R.H.

N82-21152*# National Center for Atmospheric Research, Boulder, Colo.

THE JOINT AIRPORT WEATHER STUDIES PROJECT c47

John McCarthy *In* NASA. Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Dec. 1981 p 91-95 (For primary document see

N82-21139 12-01)
Avail: NTIS HC A07/MF A01 CSCL 04B

A block diagram of the joint airport weather studies program is presented. Background leading to the development of the program is reviewed. Basic studies, aircraft performance, and detection and warning techniques used to develop fine scale structure of thunderstorm dynamics and kinematics in the vicinity of a major airport; effect of thunderstorm low level wind shear on aircraft performance; and development of real time testing of flow level wind shear detection and warning techniques and displays are described. E.A.K.

N82-21153# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ACTA AERONAUTICA ET ASTRONAUTICA SINICA
29 Dec. 1981 224 p Transl. into ENGLISH of Acta Aeron. et Astron. Sinica (China), v. 2, no. 2, 1981 p 1-102
(AD-A110282; FTD-ID(RS)T-1129-81) Avail: NTIS HC A02/MF A01 CSCL 01/3

A collection of articles in aeronautical engineering is presented. Some of the topics discussed are: (1) oscillatory subsonic potential flows around three dimensional bodies and its application in calculating dynamic stability derivatives; (2) interpolation mixed differential method for transonic large distributed symmetrical potential flow around airfoil; (3) calculation of lift and drag characteristics of subsonic wings with winglets; (4) model for predicting overload retardation effect in fatigue crack propagation; (5) J-integral experimental calibration of sheet specimens with single edge notch; (6) design of transonic turbine cascade by hodograph method; (7) three dimensional stress analysis for a shrouded air cooled turbine blade; (8) methods for measuring radar ECCM performance; (9) aiming computation for fighter weapon aiming system; (10) optimum design of nonmoment laminated composite plate. E.A.K.

N82-21154# Societe Nationale Industrielle Aerospatiale, Paris (France). Helicopter Div.
INDUSTRIAL EXPERIENCE IN THE ANGLO-FRENCH HELICOPTER COLLABORATION
J. C. Sieffer 1980 8 p
(SNIAS-811-210-101) Avail: NTIS HC A02/MF A01

Anglo-French helicopter collaboration are summarized. The development of the SA 330 Puma, the SA 341 Gazelle, and the WG 13 Lynx multipurpose helicopter, with three versions for a variety of uses, is covered, and the launching of derivative aircraft (Westland WG 30 and Aerospatiale Super-Puma) is mentioned. The organization and experience of the collaboration are described, with the French and British shares of the work on each helicopter quantified. Sales are reviewed and compared with forecasts. Author (ESA)

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*.

N82-21155# Royal Aircraft Establishment, Farnborough (England).
A SUMMARY OF EXPERIMENTAL DATA ON WING CHARACTERISTICS AT TRANSONIC SPEEDS
T. Nonweiler Apr. 1948 42 p refs
(RAE-TN-Aero-1953-S.D.-77) Avail: NTIS HC A03

Dropped and rocket propelled models are tested. American tests give a variation in form drag with thickness at the speed of sound in accordance with the two thirds power law. British tests indicate a constant dray coefficient on frontal area. There is a tendency to reduce drag by introducing taper or reducing aspect ratio on rectangular wings. Results on swept wings are inconsistent but the reduction in drag with sweepback is very pronounced. Tunnel bulge tests indicate that the drag due to lift becomes very large at Mach numbers just below 1. Author (ESA)

N82-21156*# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
HELICOPTER ROTOR LOADS USING A MATCHED ASYMPTOTIC EXPANSION TECHNIQUE Final Report
G. Alvin Pierce and Anand R. Vaidyanathan May 1981 125 p refs
(Contract NAS1-16222)
(NASA-CR-165742; NAS 1.26:165742) Avail: NTIS HC A06/MF A01 CSCL 01A

The theoretical basis and computational feasibility of the Van Holten method, and its performance and range of validity by comparison with experiment and other approximate methods was examined. It is found that within the restrictions of incompressible, potential flow and the assumption of small disturbances, the method does lead to a valid description of the flow. However, the method begins to break down under conditions favoring nonlinear effects such as wake distortion and blade/rotor interaction. E.A.K.

N82-21157*# Sikorsky Aircraft, Stratford, Conn.
AEROELASTIC ANALYSIS OF THE ELASTIC GIMBAL ROTOR Report, May 1980 - May 1981
Raymond G. Carlson and Wen-Liu Miao May 1981 102 p refs Prepared for Army Research and Technology Labs.
(Contract DAAK51-80-C-0016)
(NASA-CR-166287; NAS 1.26:166287; USAAVRADCOM-TR-82-A-3; SER-510048) Avail: NTIS HC A06/MF A01 CSCL 01A

An aeroelastic and structural loads analysis of the elastic gimbal rotor (EGR) was conducted. The structural loads analysis of the elastic gimbal rotor indicated that the gimbal spring element is the critical component in the rotor system design, but that practical designs for all components should be achievable. The aeroelastic analysis was conducted using a version of the G400 Rotor Aeroelastic Analysis especially modified to evaluate the EGR. Hover stability showed that a stiff inplane blade was more stable than a soft inplane blade. Stability was sensitive to control system coupling (pitch gimbal coupling), gimbal spring stiffness, and blade frequency placement. Ground resonance analysis showed both soft and stiff inplane rotors to be stable. A limited evaluation of the EGR in forward flight was conducted. Due to G400 analysis limitations, the results were not sufficient to define forward flight stability and stress limits. B.W.

N82-21158*# Vought Corp., Dallas, Tex.
V/STOL TANDEM FAN TRANSITION SECTION MODEL TEST
William E. Simpkin Mar. 1982 156 p refs
(Contract NAS3-22155)
(NASA-CR-165587; NAS 1.26:165587; TR2-53200/2R-53085) Avail: NTIS HC A08/MF A01 CSCL 01A

An approximately 0.25 scale model of the transition section of a tandem fan variable cycle engine nacelle was tested in the NASA Lewis Research Center 10-by-10 foot wind tunnel. Two 12-inch, tip-turbine driven fans were used to simulate a tandem fan engine. Three testing modes simulated a V/STOL tandem fan airplane. Parallel mode has two separate propulsion streams for maximum low speed performance. A front inlet, fan, and downward vectorable nozzle forms one stream. An auxilliary top inlet provides air to the aft fan - supplying the core engine and aft vectorable nozzle. Front nozzle and top inlet closure, and removal of a blocker door separating the two streams configures the tandem fan for series mode operations as a typical aircraft propulsion system. Transition mode operation is formed by intermediate settings of the front nozzle, blocker door, and top inlet. Emphasis was on the total pressure recovery and flow distortion at the aft fan face. A range of fan flow rates were tested at tunnel airspeeds from 0 to 240 knots, and angles-of-attack from -10 to 40 deg for all three modes. In addition to the model variables for the three modes, model variants of the top iniet were tested in the parallel mode only. These lip variables were: aft lip boundary layer bleed holes, and Three position turning vane. Also a bellmouth extension of the top inlet side lips was tested in parallel mode. B.W.

N82-21159*# Flow Simulations, Inc., Sunnyville, Calif.
COMPUTATION OF WING-VORTEX INTERACTION IN

TRANSONIC FLOW USING IMPLICIT FINITE DIFFERENCE ALGORITHM Final Report

G. Srinivasan and J. L. Steger Mar. 1981 63 p refs
(Contract NAS2-10474)
(NASA-CR-166251; NAS 1.26:166251) Avail: NTIS HC A04/MF A01 CSCL 01A

An implicit delta form finite difference algorithm for Euler equations in conservation law form was used in preliminary calculations of three dimensional wing vortex interaction. Both steady and unsteady transonic flow wing vortex interactions are computed. The computations themselves are meant to guide upcoming wind tunnel experiments of the same flow field. Various modifications to the numerical method that are intended to improve computational efficiency are also described and tested in both two and three dimensions. Combination of these methods can reduce the overall computational time by a factor of 4. S.L.

N82-21160# Ballistic Research Labs., Aberdeen Proving Ground, Md.

COMPUTATIONS ON THE MAGNUS EFFECT FOR SLENDER BODIES IN SUPERSONIC FLOW Final Report

Walter B. Sturek and Lewis B. Schiff Dec. 1981 44 p refs
(DA Proj. 1L1-62618-AH-80)
(AD-A110016; ARBRL-TR-02384) Avail: NTIS HC A03/MF A01 CSCL 20/4

A recently reported Parabolized Navier-Stokes code has been employed to compute the supersonic flow field about spinning cone, ogive-cylinder, and boattailed bodies of revolution at moderate incidence. The computations were performed for flow conditions where extensive measurements for wall pressure, boundary-layer velocity profiles and Magnus force had been obtained. Comparisons between the computational results and experiment indicate excellent agreement for angles of attack up to 6 deg. The comparisons for Magnus effects show that the code accurately predicts the effects of body shape and Mach number for the selected models for the selected models for $2 < \text{or} = M < \text{or} = 4$. Author (GRA)

N82-21161# Royal Aircraft Establishment, Farnborough (England).

LOW-SPEED MEASUREMENTS OF THE STATIC PRESSURE DISTRIBUTION AND OVERALL FORCES ON A CAMBERED AND A SYMMETRIC MILD GOTHIC WING OF ASPECT RATIO 1.4

P. J. Butterworth and D. G. Dobney London HMSO 22 May 1980 85 p refs
(RAE-TR-80066; RAE-AERO-3482; BR75504) Avail: NTIS HC A05/MF A01

A cambered wing of aspect ratio 1.4 was tested in a low speed wind tunnel to determine its surface static pressure distribution at its designed attached flow incidence for comparison with the theoretical loading. To isolate the effects of camber on the separated flow characteristics of this planform, the corresponding symmetric wing was also included in the test program. The lift, drag and pitching moment characteristics of each wing were measured over a range of Reynolds numbers for comparison with the results of the earlier force tests and those derived by integration of the measured pressure distributions. It is found that at twice the design lift coefficient, the lift-dependent drag of the cambered wing is about 20% lower than that of the symmetric wing due to the favorable shift of the minimum point of the drag caused by the addition of camber. At higher values of the lift coefficient this reduction in lift-dependent drag is less, due to the unfavorably changed shape of the cambered wing's drag polar. Also, flow visualization tests and the form of the measured pressure distribution near the leading edges of the cambered wing at its design incidence confirm that the flow is attached along the leading edges. Author (ESA)

N82-21162# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Flugzeuge.

AERODYNAMICS PROJECT. SIGNIFICANCE AND DIFFICULTIES IN THE EXPERIMENTAL AND NUMERICAL SIMULATION OF COMPLEX FLOW PROCESSES WITH HIGH REYNOLDS NUMBER AS PART OF AIRCRAFT PROJECTS [PROJEKTAERODYNAMIK. BEDEUTUNG UND PROBLEMATIK VON EXPERIMENTELLEN UND NUMERISCHEN SIMULATIONEN KOMPLEXER STROEMUNGSVORGAENGE MIT GROSSER REYNOLDS-ZAHL FUER DIE PROJEKTENWICKLUNG VON FLUGZEUGEN]

W. Heinzerling 29 May 1980 29 p refs In GERMAN
(MBB-FE-120/S/PUB/33; DGLR-80-028) Avail: NTIS HC A03/MF A01

The importance of aerodynamic simulation in design processes is considered. Simulation as an aid in aircraft development is discussed, revealing fundamental problems posed by the modeling of flow regimes on aircraft configurations. The geometry and complexity of flow mechanics for specific configurations are elaborated. The observance of Reynolds similarity conditions is discussed. Possibilities and limitations of complex aerodynamic simulation are assessed. Numerical, experimental, and high Reynolds number simulation are then evaluated. Results are used in reviewing plans for a European transonic cryogenic wind tunnel. Given an optimal layout, the impact of this facility on the performance and competitiveness of the European aircraft industry is forecast. Author (ESA)

N82-21163# Royal Aircraft Establishment, Farnborough (England).

PRESSURE MEASUREMENTS ON A WING OSCILLATING IN SUPERCRITICAL FLOW

N. C. Lambourne and B. L. Welsh London HMSO 25 Jun. 1979 178 p refs
(RAE-TR-79074; RAE-Struct-BF/B/0783; BR71046) Avail: NTIS HC A09/MF A01

Perturbation pressures were measured on a model wing oscillating in a wind tunnel to study wing flutter under transonic conditions. The half model, which is based on a high aspect ratio wing of modern design could be given a small-amplitude oscillation consisting of rigid body rotation about a swept axis. The unsteady in-phase and in-quadrature pressure distributions were measured at five chordwise stations. Free stream Mach number was varied in stages from 0.60 to 0.86. The measurements were restricted to one value of oscillation frequency which corresponded to frequency parameters, based on mean chord, in the range 0.39 to 0.54. The oscillatory pressure distributions together with the principal oscillatory wing forces and moments obtained by integration are considered in relation to the steady flow pattern over the wing and particularly in relation to the development of transonic mixed flow at the upper surface. The effects arising from the presence of a shock wave are identified and discussed. Some comparisons are made between the measurements and the results of subsonic thin wing theory. Author (ESA)

N82-21164# Royal Aircraft Establishment, Farnborough (England).

PRESSURE DISTRIBUTIONS ON SOME DELTA WINGS AT $M = 4$

L. C. Squire (Cambridge Univ., Engl.) and K. C. Moore London HMSO 22 May 1980 46 p refs
(RAE-TR-80068; RAE-Aero-3484; BR76040) Avail: NTIS HC A03/MF A01

Complete pressure distributions are presented for a series of delta wings tested through an incidence range at a Mach number of 4. Aspect ratios of models 1 and 3 were 4/3 and 1 respectively, and models 3 to 7, 2/3. The results were integrated to obtain lift and drag coefficients and the values found are in good agreement with the trend from measurements on similar wings at lower Mach numbers. Some of the models were designed to test a possible method of engine/airframe integration. The results show that it is possible to add volume to the rear of the wing without increasing the drag of the forebody, thus confirming the proposed method of integration. Author (ESA)

N82-21165# Royal Aircraft Establishment, Farnborough (England).

A THEORETICAL STUDY OF THE EFFECTS OF BODY SHAPE AND MACH NUMBER AN THE DRAG OF BODIES OF REVOLUTION IN SUBCRITICAL AXISYMMETRIC FLOW

D. F. Hyring 16 Jan. 1981 36 p refs
(RAE-TR-81005; RAE-Aero-3496; BR78548) Avail: NTIS HC A03/MF A01

Profile drag calculations for bodies of revolution at zero incidence in a uniform flow for a range of body shapes and Mach numbers are presented. At a fixed fineness ratio, nose

and tail contours have little influence on the profile drag coefficient based on body volume to the power 2/3. It is indicated that at low drag a body with fineness ratio of 5.5 is optimum and that a continuously changing radius distribution gives rise to slightly lower drag than that of a body with a parallel sided central section. Author (ESA)

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

N82-21166*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

FULL-SCALE FLAMMABILITY TEST DATA FOR VALIDATION OF AIRCRAFT FIRE MATHEMATICAL MODELS

Jerome F. Kuminecz and Richard W. Bricker Feb. 1982 874 p refs

(NASA-TM-58244; NAS 1.15:58244) Avail: NTIS HC A99/MF A01 CSCL 01C

Twenty-five large scale aircraft flammability tests were conducted in a Boeing 737 fuselage at the NASA Johnson Space Center (JSC). The objective of this test program was to provide a data base on the propagation of large scale aircraft fires to support the validation of aircraft fire mathematical models. Variables in the test program included cabin volume, amount of fuel, fuel pan area, fire location, airflow rate, and cabin materials. A number of tests were conducted with jet A-1 fuel only, while others were conducted with various Boeing 747 type cabin materialsj These included urethane foam seats, passenger service units, stowage bins, and wall and ceiling panels. Two tests were also included using special urethane foam and polyimide foam seats. Tests were conducted with each cabin material individually, with various combinations of these materials, and finally, with all materials in the cabin. The data include information obtained from approximately 160 locations inside the fuselage. Author

N82-21167# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Biomechanical Protection Branch.

EVALUATION OF A PROPOSED MODIFIED F/FB-111 CREW SEAT AND RESTRAINT SYSTEM

James W. Brinkley, James H. Raddin, Jr., Bernard F. Hearon, Lawrence A. McGowan, and Joseph M. Powers Nov. 1981 418 p refs

(AF Proj. 7231)

(AD-A110188; AFAMRL-TR-80-52) Avail: NTIS HC A18/MF A01 CSCL 01/3

A total of 187 human impact tests were performed in the cardinal axes, including vertical (up to 10G, 8.1 m/sec), sideward (up to 8G, 9.2 m/sec), and forward facing (up to 10G, 9.8 m/sec). Subjects were exposed to similar impacts using different seat position adjustments to allow parametric analysis. Measured data included seat acceleration and velocity, head and chest translational acceleration components, triaxial forces acting on the seat pan and footrest, forces acting at the restraint harness attachments, and displacements of various body segments. In vertical impact tests, the forward position of the headrest appeared to cause increased forward acceleration of the head. Vertical impact tests demonstrated increased head accelerations with higher shoulder harness angles. Analysis of restraint loads in sideward impacts showed that more of the lateral support is provided by the lap belt with higher shoulder harness angles. This indicates potentially degraded lateral support of the upper torso with the proposed modification. GRA

N82-21168# Motor Industry Research Association, Lindley (England).

PREDICTION OF SEAT BELT FIT: COMPARISON BETWEEN A GEOMETRICAL MODEL AND WEARER PERFORMANCE

C. M. Haslegrave 1980 38 p refs Sponsored in part by MEMTRB

(MIRA-1980/1) Avail: NTIS HC A03/MF A01

A geodesic computer model was developed for the assessment of seat belt fit. The technique was validated by comparison between the predictions of the model and reports of subjective assessments of belt layouts. It was also used to assess the comfort of installations in current cars for a group of six representative car occupants. The assessment uses a planar development method with a geometrical representation of the occupant. The lie of the seat belt over the ocupant's body can then be viewed in a single plane and areas defined in which the lie is comfortable. The predictions of the geodesic model give a fairly good correspondence with the subjective preferences, particularly for anchorages located above and behind the shoulder, as found on the B-post of many cars. The comparison indicates that the model needed some further development in consideration of the seating posture adopted by car occupants and the point at which the belt is perceived likely to slip off the wearer's shoulder. Author (ESA)

N82-21142*# USAir, Pittsburgh, Pa.

OPERATIONAL PROCEDURES RELATIVE TO SEVERE WEATHER

James F. Sullivan *In* NASA. Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Dec. 1981 p 26-28 (For primary document see N82-21139 12-01)

Avail: NTIS HC A07/MF A01 CSCL 01C

N82-21148*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NASA/LEWIS RESEARCH CENTER ICING RESEARCH PROGRAM

Peggy L. Evanich *In* NASA. Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Dec. 1981 p 64-75 (For primary document see N82-21139 12-01)

Avail: NTIS HC A07/MF A01 CSCL 01C

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N82-21169*# Analytical Mechanics Associates, Inc., Hampton, Va.

RECOMMENDED ENTREE S-BAND AND DOPPLER MODELS

G. Mel Kelly Sep. 1980 14 p refs

(Contract NAS1-16087)

(NASA-CR-165884; NAS 1.26:165884; AMA-80-15) Avail: NTIS HC A02/MF A01 CSCL 17G

Based on comparisons between instantaneous and light time delay (LTD) formulations for S band range and Doppler observables, expanded models for instantaneous S band observables are recommended for inclusion in the ENTREE program. In a worst case situation using Guam tracking for a representative shuttle entry trajectory, the proposed ENTREE model differs from the LTD model by approximately + or - 0.2 ft in range and + or - 0.02 Hz in Doppler. In contrast, the maximum differences between the existing ENTREE model and the LTD model are approximately (-80, +60) ft in range and (-4, -1) Hz in Doppler. S.L.

N82-21170# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.

PASSIVE NAVIGATION

Anna R. Bruss and Berthold K. P. Horn Nov. 1981 22 p refs

(Contract N00014-80-C-0505; Grant NSF MCS-77-07569)

(AD-A110070; AI-M-662) Avail: NTIS HC A02/MF A01 CSCL 17/7

A method is proposed for determining the motion of a body relative to a fixed environment using the changing image seen by a camera attached to the body. The optical flow in the image plane is the input, while the instantaneous rotation and translation of the body are the output. If optical flow could be determined precisely, it would only have to be known at a few places to compute the parameters of the motion. In practice, however, the measured optical flow will be somewhat inaccurate. It is therefore advantageous to consider methods which use as much of the available information as possible. We employ a least-squares approach which minimizes some measure of the discrepancy between the measured flow and that predicted from the computed motion parameters. Several different error norms are investigated. In general, our algorithm leads to a system of nonlinear equations from which the motion parameters may be computed numerically. However, in the special cases where the motion of the camera is purely translational or purely rotational, use of the appropriate norm leads to a system of equations from which these parameters can be determined in closed form. GRA

N82-21171# Mitre Corp., McLean, Va. Metrek Div.
PRELIMINARY FUNCTIONAL DESCRIPTION OF INTEGRATED FLOW MANAGEMENT
D. L. Adams, Stephen M. Alvania (FAA), Roger Brubaker (FAA), Kerry M. Levin, Richard J. Marek (FAA), M. F. Medeiros (Transportation Systems Center), G. R. Rowland (FAA), and A. N. Sinha Oct. 1981 246 p refs
(Contract DTFA01-81-C-10001)
(AD-A109909; MTR-81W252; FAA-EM-82-7) Avail: NTIS HC A11/MF A01 CSCL 05/1

A preliminary functional description of Integrated Flow Management (IFM) is documented in this report. The objective is to provide a strawman concept so that further IFM development activities will proceed from a common reference point based upon agreement among all related program organizations. The distribution of flow management functions among the various ATC facilities and the related interfacility communications requirements are central issues addressed in this report. A road map projection of the IFM near term evolution through the late 1980s and remaining open issues related to the IFM development are also presented. Author (GRA)

N82-21172# Eclectech Associates, Inc., North Stonington, Conn.
AIDS TO NAVIGATION PRINCIPAL FINDINGS REPORT: RANGE LIGHT CHARACTERISTICS AND THEIR EFFECT ON PERFORMANCE Interim Report
K. L. Marino, M. W. Smith, and M. R. Bertsche Dec. 1981 103 p refs
(Contract DOT-CG-835285-A)
(AD-A109716; EA-81-U-077; USCG-D-66-81) Avail: NTIS HC A06/MF A01 CSCL 17/7

The relationship between variables related to aids to navigation and piloting performance in narrow channels and, potentially, safety in such channels was examined. The variable conditions evaluated are: (1) sensitivity ranges (high lateral sensitivity at K is approximately 4.5 or low lateral sensitivity at K approximately 0.5); (2) designated track (with the objective to stay either on the centerline or on the right quarterline), and (3) angle of turn (15 degree or 35 degree noncutoff turn). The constant conditions were a 500 foot channel with two 1.3 nm straight legs joined by a bend. Each straight leg has a range light marking the centerline of the legs and these were the only aids available. The scenarios were run at night with wind and current varying through the transit. The findings of the experiment are presented as the means and standard deviations of crosstrack position of transients under each condition are presented. E.A.K.

N82-21173# Federal Aviation Administration, Atlantic City, N.J. Technical Center.
JOINT US/USSR MODE S COMPATIBILITY TEST PROGRAM, VOLUME 1 Final Report, 5 Oct. - 30 Oct. 1981
Rodney Guishard and Anatoly Bolshev Oct. 1981 36 p refs 2 Vol.
(FAA Proj. 034-241-510)
(PB82-126616; DOT/FAA-CT-82-16-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 17G

The compatibility of a U.S.S.R. designed transponder with the U.S. Mode S system was investigated. A U.S. transponder was included in these tests for convenient comparison of results. Both bench tests and flight tests were conducted to ascertain compatibility to the U.S. Discrete Address Beacon System (DABS) National Standard of 1978. Radial and orbital flight profiles were used to gather statistical data to draw conclusions about the transponder's performance in conjunction with the Mode S system. Both the methods of conducting these tests and the results obtained are described. GRA

N82-21174# Federal Aviation Administration, Atlantic City, N.J. Technical Center.
JOINT US/USSR MODE S COMPATIBILITY TEST PROGRAM, VOLUME 2 Final Report, 5 Oct.- 30 Oct. 1981
Rodney Guishard and Anatoly Bolshev Oct. 1981 143 p 2 Vol.
(FAA Proj. 034-241-510)
(PB82-126624; DOT/FAA-CT-82-16-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 17G

Data collected during the compatibility tests are presented. These tests included a U.S. transponder for convenience of comparison. It is concluded that the U.S.S.R. mode S transponder operated successfully and is compatible with the U.S. mode S system. Performance of both the U.S. and U.S.S.R. transponders were comparable. T.M.

N82-21144*# Federal Aviation Administration, Washington, D.C. Systems Research and Development Div.
METEOROLOGY IMPACT ON ATC SYSTEM DESIGN
Frank E. VanDemark *In* NASA. Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Dec. 1981 p 35-39 (For primary document see N82-21139 12-01)
Avail: NTIS HC A07/MF A01 CSCL 17G

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

N82-21175*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
AIRCRAFT INTERROGATION AND DISPLAY SYSTEM: A GROUND SUPPORT EQUIPMENT FOR DIGITAL FLIGHT SYSTEMS
Richard D. Glover Apr. 1982 46 p refs
(NASA-TM-81370; NAS 1.15:81370) Avail: NTIS HC A03/MF A01 CSCL 01D

A microprocessor-based general purpose ground support equipment for electronic systems was developed. The hardware and software are designed to permit diverse applications in support of aircraft flight systems and simulation facilities. The implementation of the hardware, the structure of the software, describes the application of the system to an ongoing research aircraft project are described. T.M.

N82-21176# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
GENERIC TEST BED (GTB) AIRCRAFT Final Report, 1 May 1980 - 1 Oct. 1981
Donald R. Chislaghi, Dennis W. Jarvi, and Steven R. Markman Dec. 1981 61 p refs
(AD-A110335; ASD-TR-81-5036) Avail: NTIS HC A04/MF A01 CSCL 01/3

The Night Attack Workload Steering Group (NAWSG) was requested by HQ AFSC/SD to investigate the need for a Generic Test Bed aircraft and to identify potential candidate aircraft. The team learned a need existed for an aircraft that could perform near the night attack envelope. The aircraft is needed to test, under realistic conditions, both the avionics and their effect on pilot crew workload. The team also identified several potential candidate aircraft that had sufficient cockpit space, volume, cooling and power to permit it to support this mission. Author (GRA)

N82-21177# Army Aviation Engineering Flight Activity, Edwards AFB, Calif. Directorate for Development and Qualification.
PRELIMINARY AIRWORTHINESS EVALUATION OF THE UH-1H WITH HOT METAL PLUS PLUME INFRARED SUPPRESSOR AND INFRARED JAMMER Final Report, 16 Jan. - 18 May 1981
Bartholomew D. Picasso, III, John D. Ottomeyer, Loran A. Haworth, and Richard Vincent Jun. 1981 87 p refs
(AD-A110213; USAAEFA-80-06) Avail: NTIS HC A05/MF A01 CSCL 01/2

The Preliminary Airworthiness Evaluation (PAE) of the UH-1H, with the Infrared (IR) Suppressor and AN/ALQ-144 IR Jammer installed, was conducted using a JUH-1H. The initial design cused a degradation in directional stability. The installation was redesigned to reduce the airflow disturbance over the tail rotor and vertical stabilizer. This evaluation was conducted in two phases. Phase 1 was a comparative evaluation of handling qualities of the UH-1H in both the standard and IR suppressor configurations. Phase 2 was primarily a pressure and temperature survey of the IR suppressor configuration. The handling qualities of the UH-1H helicopter were essentially unchanged by the IR suppressor and IR jammer installation tested. The tail boom surface temperatures were higher for the initial design. The metal to metal contact between the engine exhaut ejector and the IR suppressor inner core support struts,was identified. Three shortcomings were also identified. GRA

N82-21178# Naval Air Test Center, Patuxent River, Md. Systems Engineering Test Directorate.
ALQ-164 POD/AV-8C ENVIRONMENTAL EVALUATION FLIGHT TEST
Lawrence J. Mertaugh 11 Dec. 1981 152 p
(AD-A110198; NATC-TM-81-109-SY) Avail: NTIS HC A08/MF A01 CSCL 01/3

This report provides the test results of a flight test program conducted to evaluate the environmental conditions to which the ALQ-164 pod is exposed when carried on the AV-8C aircraft. Descriptions are provided of the test program, test equipment, instrumentation, and methods of analysis. The test results include cooling-air mass flow and temperature, vibration levels measured on the pod structure and on the isolator mounted equipment support structure, and pod skin temperature. Test conditions include steady-state conditions throughout the available pod/aircraft flight envelope as well as various vertical takeoff and landing, short takeoff and landing and gun fire operations.
Author (GRA)

N82-21179# Systems Technology, Inc., Hawthorne, Calif.
OPTIMAL TERRAIN-FOLLOWING FEEDBACK CONTROL FOR ADVANCED CRUISE MISSILES Final Report
Richard F. Whitbeck and Julian Wolkovitch (Aeronautical Consultant Associates) Jan. 1982 48 p refs
(Contract N00014-79-C-0657)
(AD-A110286) Avail: NTIS HC A03/MF A01 CSCL 16/4

A cruise missile is a vehicle that spends the major portion of its flight at essentially constant altitude and speed. Some cruise missiles are flown at very low altitudes in order to avoid detection. The terrain-following capabilities of such a missile and its guidance system are of importance. It is desirable that the missile should follow closely the contour of the terrain, which may be fixed (Land) or time-varying (ocean waves). A previous study (Ref. 1) demonstrated that optimal control theory could usefully be applied to calculate the best achievable accuracy of terrain-following. Reference 1 showed that, even with an optimal guidance system, terrain-following accuracy was limited by considerations of the cruise missile's inertias, airspeed, and aerodynamic configuration. Author (GRA)

N82-21180# Lockheed-Georgia Co., Marietta.
NUMERICAL AIRCRAFT DESIGN USING 3-D TRANSONIC ANALYSIS WITH OPTIMIZATION. VOLUME 1: EXECUTIVE SUMMARY Final Report, May 1978 - Sep. 1980
A. J. Srokowski, M. E. Lores, and P. Aidala (Grumman Aerospace Corp., Bethpage, N.Y.) Wright-Patterson AFB, Ohio AFWAL Aug. 1981 59 p refs 2 Vol.
(Contract F33615-78-C-3014; AF Proj. 2404)
(AD-A110035; LG81ER0107-Vol-1; AFWAL-TR-81-3091-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 20/4

A detailed summary of the work performed in the Advanced Transonic Technology (ATT) program to incorporate 3-D Transonic computational aerodynamics methods into aircraft design procedures is presented. Existing transonic analysis programs were modified for the design procedure and linked with a numerical optimization program to design wings that are in some sense optimized for a given set of design conditions. The design procedure was validated by applying it in two design case studies. The application of the design procedure in each of these case studies is described in detail. The configurations resulting from these studies were subjected to design verification wind tunnel testing. Comparisons of test data with computed results are presented. GRA

N82-21181# Lockheed-Georgia Co., Marietta.
NUMERICAL AIRCRAFT DESIGN USING 3-D TRANSONIC ANALYSIS WITH OPTIMIZATION, VOLUME 2. PART 1: TRANSPORT DESIGN Final Report, May 1978 - Sep. 1980
A. J. Srokowski, M. E. Lores, R. A. Weed, and P. R. Smith Wright-Patterson AFB, Ohio AFWAL Aug. 1981 187 p refs Prepared in cooperation with Grumman Aerospace Corp., Bethpage, N.Y. 2 Vol.
(Contract F33615-78-C-3014; AF Proj. 2404)
(AD-A110231; LG81ER0107-Vol-2-Pt-1; AFWAL-TR-81-3091-Vol-Pt-1) Avail: NTIS HC A09/MF A01 CSCL 20/4

The purpose was to develop and validate a new transonic wing design procedure using the numerical optimization technique. The new procedure was used to design both a transport and a fighter configuration. Because the missions and design requirements of a fighter and transport are so different, the design procedure was developed along parallel lines. The results of a transport design case study performed to evaluate the transonic aircraft design procedure developed as part of the Advanced Transonic Technology (ATT) program are presented. A derivative of the C141B aircraft was selected as the design configuration. The design procedure was applied to the baseline configuration and the performance of resulting configuration was then compared to the C141 aircraft. Extensive wind tunnel testing of the design configuration was performed to validate the design procedure. The results of the wind tunnel tests are correlated with computational results generated in the design process. In addition, the evolution of the design procedure and its application in the transport design case study is discussed. GRA

N82-21182# Lockheed-Georgia Co., Marietta.
NUMERICAL AIRCRAFT DESIGN USING 3-D TRANSONIC ANALYSIS WITH OPTIMIZATION, VOLUME 2. PART 2: FIGHTER DESIGN Final Report, May 1978 - Sep. 1980
P. Aidala Wright-Patterson AFB, Ohio AFWAL Aug. 1981 64 p refs Prepared in cooperation with Grumman Aerospace Corp., Bethpage, N.Y.
(Contract F33615-78-C-3014; AF Proj. 2404)
(AD-A110036; LG81ER0107-Vol-2-Pt-2; AFWAL-TR-81-3091-Vol-2-Pt-2) Avail: NTIS HC A04/MF A01 CSCL 20/4

The results of a fighter design case study performed to evaluate the transonic aircraft design procedure developed as part of the Advanced Transonic Technology (ATT) program are presented. The fighter design is based on the Configuration Design of Advanced Fighters program dual role configuration. Extensive wind tunnel testing of the design configuration was performed to validate the design procedure. The results of the wind tunnel tests are correlated with computational results generated in the design process. The purpose of the ATT program was to develop and validate a new transonic wing design procedure using numerical optimization. The new procedure was used to design both a transport and a fighter configuration. Because the missions and design requirements of a fighter and transport are so different, the design procedure was developed along parallel lines. This is Part 2 of a two-part volume: Part 1 details the transport development, and Part 2 describes the fighter development. There are two other volumes which make up the final report. Volume 1 is an executive summary. It highlights the information that has been presented in detail here. GRA

N82-21183# Lockheed-Georgia Co., Marietta.
NUMERICAL AIRCRAFT DESIGN USING 3-D TRANSONIC ANALYSIS WITH OPTIMIZATION, VOLUME 3. PART 1: USER'S GUIDE TO TRANSPORT DESIGN COMPUTER PROGRAMS Final Report, May 1978 - Sep. 1980
R. A. Weed and A. J. Srokowski Wright-Patterson AFB, Ohio AFWAL Aug. 1981 136 p refs Prepared in cooperation with Grumman Aerospace Corp., Bethpage, N.Y.
(Contract F33615-78-C-3014; AF Proj. 2404)
(AD-A110232; LG81ER0107-Vol-3-Pt-1; AFWAL-TR-81-3091-Vol-3-Pt-1) Avail: NTIS HC A07/MF A01 CSCL 20/4

This document is the first part of a two part volume of detailed User's Guide for the computer programs of a new transonic wind design procedure. Part 1 presents the User's Guide for the transport design programs produced by Lockheed-Georgia Company and Part 2 presents the User's Guide for the fighter design programs. The purpose of the contract was to develop and validate a new transonic wing design procedure using the numerical optimization technique. The new procedure was used to design both a transport and a fighter configuration. Because the missions and design requirements of a fighter and transport are so different, the design procedure was developed along parallel lines. Lockheed-Georgia Co. developed the transport design procedure, and Grumman Aerospace Corp. developed the fighter design procedures. Users guides for the computer programs used in the transport design case study for the aircraft design procedure developed as part of the Advanced Transonic Technology (ATT) program are presented. These programs include two 3D transonic wing analysis codes linked to a numerical optimizing routine, a two dimensional strip boundary layer program and a wing pylon nacelle interference program. The input data required by each program is described in detail. Samples of the output from each program are presented. Author (GRA)

N82-21184# Lockheed-Georgia Co., Marietta.
NUMERICAL AIRCRAFT DESIGN USING 3-D TRANSONIC ANALYSIS WITH OPTIMIZATION, VOLUME 3. PART 2: USER'S GUIDE TO FIGHTER DESIGN COMPUTER PROGRAM Final Report, May 1978 - Sep. 1980
P. Aidala Wright-Patterson AFB, Ohio AFWAL Aug. 1981 88 p refs Prepared in cooperation with Grumman Aerospace Corp., Bethpage, N.Y.
(Contract F33615-78-C-3014; AF Proj. 2404)
(AD-A110037; LG81ER0107-Vol-3-Pt-2; AFWAL-TR-81-3091-Vol-3-Pt-2) Avail: NTIS HC A05/MF A01 CSCL 20/4

A User's Guide for the computer code used in the fighter design case study of the Advanced Transonic Technology (ATT) program is presented. The design code includes a 3D transonic wing-body-canard analysis program linked to a numerical optimization routine and a two dimensional strip boundary layer program. The input data required is described in detail and samples of the output are presented. The purpose of the ATT program was to develop and validate a new transonic wing design procedure using the numerical optimization technique. The new procedure was used to design both a transport and a fighter configuration. Because the missions and design requirements of a fighter and transport are so different, the design procedure was developed along parallel lines. Lockheed-Georgia Co. developed the transport design procedure, and Grumman Aerospace Corp. developed the fighter design procedure. This document is the second part of a two-part volume of detailed User's Guides for the computer programs produced by Lockheed-Georgia Company and Grumman Aerospace Corp. of a new transonic wing design procedure. GRA

N82-21185# Messerschmidt-Boelkow G.m.b.H., Munich (West Germany). Unternehmensbereich Drehfluegler.
HELICOPTER VIBRATION CONTROL: A SURVEY
G. Reichert Ottobrunn, West Germany 1 Sep. 1980 31 p refs Presented at 6th European Rotocraft and Powered Lift Aircraft Forum, Bristol, England, 16-19 Sep. 1980
(MBB-UD-302/80-O) Avail: NTIS HC A03/MF A01

Methods for reducing helicopter vibrations are reviewed including structural optimization of the rotor and the whole helicopter, blade and rotor pendulum absorbers, rotor isolation concepts following the antiresonance principle (nodal isolation), and active isolation devices. Vibration characteristics at various speeds and during maneuvers are summarized. The integration of vibration considerations during design and development are shown, including finite element modeling in the detail design phase. Developments in automatic harmonic blade pitch control utilizing closed loop systems are mentioned. Author (ESA)

N82-21186# Messerschmidt-Boelkow G.m.b.H., Munich (West Germany). Unternehmensbereich Drehfluegler.
INVESTIGATIONS OF HELICOPTER WTRUCTURAL DYNAMICS AND A COMPARISON WITH GROUND VIBRATION TESTS
J. Stoppel and M. Degener (DFVLR, Goettingen, West Germany) Ottobrun, West Germany 8 Sep. 1980 20 p refs Presented at 6th European Rotorcraft and Powered Lift Aircraft Forum, Bristol, England, 16-19 Sep. 1980 Sponsored by Bundesministerium fuer Forschung und Technologie
(MBB-UD-303/80-O) Avail: NTIS HC A02/MF A01

A BO-105 helicopter was studied using the NASTRAN program applied to one model with 4400 degrees of freedom and a second with 1300 degrees of freedom. Ground vibration tests were performed on an actual helicopter (CO-105) to determining the modal parameters of the structure within a frequency of 56 Hz for comparison with the models. The suspended aircraft was excited by six electrodynamic exciters. Dynamic response was measured by inductive accelerometers. Comparison of model results with test data shows that most all measured natural modes have a corresponding analytical mode. There were 30 measured natural modes up to 60 Hz. Some 40 modes, including the six rigid body modes, were calculated. Only five modes in the high frequency range from 50 to 70 Hz have no equivalent from measurements. Most of the frequencies show very good agreement between measurement and calculation. Less than perfect correlation is seen for the pitching modes, which are influenced mainly by the tail boom. Central processor times on an IBM 360-370 model 3033 were 100 sec and 500 sec for the simple and complex models, respectively. Author (ESA)

N82-21187# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Drehfluegler.
A HINGELESS TAIL ROTOR OF FIBER COMPOSITE CONSTRUCTION AND VIBRATION ISOLATOR SYSTEMS (ARIS, AVIS) FOR HELICOPTERS [GELENKLOSER HECKROTOR IN FASERVERBUND-BAUWEISE UND SCHWINGUNGS-ISOLATIONSSYSTEME (ARIS, ASIS) FUER HUBSCHRAUBER]
G. Reichert 8 Oct. 1980 37 p refs In GERMAN Presented at 2nd Bundesministerium fuer Forsch. und Technol. Statusseminar on Luftfahrtforsch. und Luftfahrttechnol., Garmisch-Partenkirchen, West Germany, 8-9 Oct. 1980
(MBB-UD-311/80-OE) Avail: NTIS HC A03/MF A01

Systems research and development were undertaken in order to reduce cost and improve characteristics of helicopters. An experimental tail rotor development program and methods of reducing airframe vibration are centered on. Definition, construction, and testing of a three-blade and a four-blade tail rotor system are discussed. Two vibration isolator systems (ARIS; AVIS) are next described. Passive and active force isolators were developed and tested in engineering models. It is proposed that all this equipment be subjected to full scale testing in helicopter assemblies. Author (ESA)

N82-21188# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Drehfluegler.
RATIONAL PRODUCTION METHODS FOR THE MANUFACTURE OF HELICOPTER ROTOR BLADES [RATIONELLE FERTIGUNGSVERFAHREN ZUR HERSTELLUNG VON HUBSCHRAUBER-ROTORBLAETTERN]
Klaus Brunsch 8 Oct. 1980 27 p refs In GERMAN Presented at 2nd Bundesministerium fuer Forschung und Technologie Statusseminair Luftfahrtforsch. und Luftfahrttechnol., Garmisch-Partenkirchen, West Germany, 8-9 Oct. 1980
(MBB-UD-312/80-OE) Avail: NTIS HC A03/MF A01

The construction of BO-105/BK 117 rotor blade and the partial mechanization of its production are described. Series production of this rotor blade involves severe tolerances, regarding mass, mass distribution, geometry, mechanical properties, aerodynamics, etc. The necessity of these requirements is

explained and consequences on the design of mass manufacturing work stations are pointed out. Development underway to fully automate rotor blade manufacture is then reviewed.
Author (ESA)

N82-21189# Societe Nationale Industrielle Aerospatiale, Suresnes (France). . Lab. Central de l'Aerospatiale.
ON THE CHOICE OF LIGHT ALLOYS IN AERONAUTICS [CHOIX DES ALLIAGES LEGERS EN AERONAUTIQUE]
J. Odorico Paris 30 Apr. 1981 18 p In FRENCH Presented at Journees d'Etudes Conf. on Tenue des Pieces en Mecanique, Lyon, 20-22 May 1981
(SNIAS-811-551-102) Avail: NTIS HC A02/MF A01

Engineering considerations as to material mechanical properties, taken into account at the aircraft design stage, are reviewed. The choice of materials must meet specifications of performance, durability, and reliability. Criteria by which reliability is determined essentially derive from material characteristics before and after undergoing stresses. Three predominant causes of material degradation (cracking) are examined: fatigue, corrosion, and stress corrosion. As to the choice of metallic aircraft materials, their behavior is well documented. Envisaging an order of magnitude improvement in the fundamental characteristics of aircraft light alloys, aluminum alloys obtained by conventional metallurgy are seen as an inappropriate choice. Author (ESA)

N82-21190# Royal Aircraft Establishment, Farnborough (England).
REDUCTION OF STRUCTURAL VIBRATION BY A DYNAMIC ABSORBER
J. M. Williams Dec. 1980 29 p refs
(RAE-TM-AERO-1881; BR77778) Avail: NTIS HC A03/MF A01

The transmission of vibration in dynamic systems is described. An example conswasting of two freely supported elastic plates, connected by a rigid link was studied in connection with helicopter gear boxes and cabins. The addition of a dynamic absorber to such a system can significantly attenuate the transmitted velocities over a chosen narrow frequency band. The harmonic excitation of thin plates is explained. Author (ESA)

N82-21191# National Mechanical Engineering Research Inst., Pretoria (South Africa).
USE OF COMPOSITE MATERIALS FOR HELICOPTER ROTOR BLADES
M. S. Hunt 1980 33 p refs
(PB82-124041; CSIR-ME-1674; ISBN-0-7988-1470-5)
Copyright. Avail: NTIS HC A03/MF A01 CSCL 01C

Arguments in favor of the use of fiber reinforced composite materials for helicopter rotor blades are presented. The design and manufacturing techniques developed in an Institute are discussed and some of the results obtained in the structural testing program are given. GRA

N82-21140*# Federal Aviation Administration, Washington, D.C. Energy Div.
METEOROLOGICAL IMPACT ON AVIATION FUEL EFFICIENCY
David E. Winer and John E. Wesler *In* NASA. Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Dec. 1981 p 15-19 refs (For primary document see N82-21139 12-01)
Avail: NTIS HC A07/MF A01 CSCL 01C

N82-21143*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
METEOROLOGY IMPACT ON FUTURE AIRCRAFT DESIGN
Joseph W. Stickle *In* NASA. Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Dec. 1981 p 29-34 (For primary document see N82-21139 12-01)
Avail: NTIS HC A07/MF A01 CSCL 01C

N82-21149*# Dayton Univ., Ohio.
EFFECT OF HEAVY RAIN ON AIRCRAFT
James K. Luers *In* NASA. Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Dec. 1981 76-80 (For primary document see N82-21139 12-01)
Avail: NTIS HC A07/MF A01 CSCL 01C

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N82-21192# British Aerospace Aircraft Group, Preston (England).
SAFRA: CONTROLLED REQUIREMENTS EXPRESSION
D. Y. Forsyth and A. O. Ward Jan. 1980 105 p refs
(BAe-TNAAS-84) Avail: NTIS HC A06/MF A01

A collection of procedures and tools for improving the way in which avionic system and software requirements are derived and validated are described. In the contex of SAFRA, the method of derivation proposed is a technique termed controlled requirements expression (CORE) and the information structure is modelled on an existing standard for requirement specification. The automated aid is the University of Michigan's ISDOS consisting of the problem statement language (PSL) and problem statement analyzer. The diagrammatic notation used in CORE is explained and the representation of the various relationships in the PSL are shown. Examples are depicted for an avionics system.
Author (ESA)

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N82-21193*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COLD-AIR PERFORMANCE OF A 15.41-cm-TIP-DIAMETER AXIAL-FLOW POWER TURBINE WITH VARIABLE-AREA STATOR DESIGNED FOR A 75-kW AUTOMOTIVE GAS TURBINE ENGINE Final Report
Kerry L. McLallin, Milton G. Kofskey, and Robert Y. Wong Feb. 1982 33 p refs
(Contract DE-AI01-77CS-51040)
(NASA-TM-82644; E-899; NAS 1.15:82644; DOE/NASA/51040-30) Avail: NTIS HC A03/MF A01 CSCL 21E

An experimental evaluation of the aerodynamic performance of the axial flow, variable area stator power turbine stage for the Department of Energy upgraded automotive gas turbine engine was conducted in cold air. The interstage transition duct, the variable area stator, the rotor, and the exit diffuser were included in the evaluation of the turbine stage. The measured total blading efficiency was 0.096 less than the design value of 0.85. Large radial gradients in flow conditions were found at the exit of the interstage duct that adversely affected power turbine performance. Although power turbine efficiency was less than design, the turbine operating line corresponding to the steady state road load power curve was within 0.02 of the maximum available stage efficiency at any given speed. Author

N82-21194*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PRELIMINARY RESULTS ON PERFORMANCE TESTING OF A TURBOCHARGED ROTARY COMBUSTION ENGINE
P. R. Meng, W. J. Rice, H. J. Schock, and D. P. Pringle 1982 24 p refs Presented at the 1982 Soc. of Automotive Engrs. Intern. Congr. and Exposition, Detroit, 22-26 Feb. 1982
(NASA-TM-82772; E-1097; NAS 1.15:82772) Avail: NTIS HC A02/MF A01 CSCL 21E

The performance of a turbocharged rotary engine at power

levels above 75 kW (100 hp) was studied. A twin rotor turbocharged Mazda engine was tested at speeds of 3000 to 6000 rpm and boost pressures to 7 psi. The NASA developed combustion diagnostic instrumentation was used to quantify indicated and pumping mean effect pressures, peak pressure, and face to face variability on a cycle by cycle basis. Results of this testing showed that a 5900 rpm a 36 percent increase in power was obtained by operating the engine in the turbocharged configuration. When operating with lean carburetor jets at 105 hp (78.3 kW) and 4000 rpm, a brake specific fuel consumption of 0.45 lbm/lb-hr was measured. B.W.

N82-21195*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYTICAL INVESTIGATION OF NONRECOVERABLE STALL
Leon M. Wenzel and William M. Bruton Feb. 1982 23 p refs
(NASA-TM-82792; E-1126; NAS 1.15:82792) Avail: NTIS HC A02/MF A01 CSCL 21E

A lumped parameter model of the TF34 engine is formulated to study nonrecoverable stall. Features of the model include forward and reverse flow, radial flow in the fan, and variable corrected speed. The purpose of the study is to point out those parameters to which recoverability is highly sensitive but are not well known. Experimental research may then be directed toward identification of the parameters in that category. Compressor performance in the positive flow region and radial flow in the fan are shown to be important but unknown parameters determining recoverability. Other parameters such as compressor performance during reverse flow and in-stall efficiency have relatively small impact on recoverability. Author

N82-21196*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.
ENERGY EFFICIENT ENGINE SHROUDLESS, HOLLOW FAN BLADE TECHNOLOGY REPORT
C. J. Michael Dec. 1981 91 p refs
(Contract NAS3-20646)
(NASA-CR-165586; NAS 1.26:165586; PWA-5594-199) Avail: NTIS HC A05/MF A01 CSCL 21E

The Shroudless, Hollow Fan Blade Technology program was structured to support the design, fabrication, and subsequent evaluation of advanced hollow and shroudless blades for the Energy Efficient Engine fan component. Rockwell International was initially selected to produce hollow airfoil specimens employing the superplastic forming/diffusion bonding (SPF/DB) fabrication technique. Rockwell demonstrated that a titanium hollow structure could be fabricated utilizing SPF/DB manufacturing methods. However, some problems such as sharp internal cavity radii and unsatisfactory secondary bonding of the edge and root details prevented production of the required quantity of fatigue test specimens. Subsequently, TRW was selected to (1) produce hollow airfoil test specimens utilizing a laminate-core/hot isostatic press/diffusion bond approach, and (2) manufacture full-size hollow prototype fan blades utilizing the technology that evolved from the specimen fabrication effort. TRW established elements of blade design and defined laminate-core/hot isostatic press/diffusion bonding fabrication techniques to produce test specimens. This fabrication technology was utilized to produce full size hollow fan blades in which the HIP'ed parts were cambered/twisted/isothermally forged, finish machined, and delivered to Pratt & Whitney Aircraft and NASA for further evaluation. Author

N82-21197*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
CF6 JET ENGINE DIAGNOSTICS PROGRAM: HIGH PRESSURE COMPRESSOR CLEARANCE INVESTIGATION
M. A. Radomski Jan. 1982 48 p ref
(Contract NAS3-20631)
(NASA-CR-165580; NAS 1.26:165580; R82AEB189) Avail: NTIS HC A03/MF A01 CSCL 21E

The effects of high pressure compressor clearance changes on engine performance were experimentally determined on a CF6 core engine. The results indicate that a one percent reduction in normalized average clearance, expressed as a fraction of airfoil length, improves compressor efficiency by one percent. Compressor clearances are reduced by the application of rotor bore cooling, insulation of the stator casing, and use of a low coefficient of expansion material in the aft stages. This improvement amounts to a reduction of normalized average clearance of 0.78 percent, relative to CF6-60 compressor, which is equivalent to an improvement in compressor efficiency of 0.78 percent. J.M.S.

N82-21198*# Computing Devices Co., Ottawa (Ontario).
OPTIMIZATION OF THRUST ALGORITHM CALIBRATION FOR COMPUTING SYSTEM (TCS) FOR THRUST THE NASA HIGHLY MANEUVERABLE AIRCRAFT TECHNOLOGY (HiMAT) VEHICLE'S PROPULSION SYSTEM Final Report
M. J. Hamer and R. I. Alexander Dec. 1981 77 p refs
(Contract NAS4-2812)
(NASA-CR-163121; NAS 1.26:16321; A011/FR) Avail: NTIS HC A05/MF A01 CSCL 21E

A simplified gross thrust computing technique for the HiMAT J85-GE-21 engine using altitude facility data was evaluated. The results over the full engine envelope for both the standard engine mode and the open nozzle engine mode are presented. Results using afterburner casing static pressure taps are compared to those using liner static pressure taps. It is found that the technique is very accurate for both the standard and open nozzle engine modes. The difference in the algorithm accuracy for a calibration based on data from one test condition was small compared to a calibration based on data from all of the test conditions. E.A.K.

N82-21199# General Motors Corp., Indianapolis, Ind. Diesel Allison Div.
EXPERIMENTAL INVESTIGATION OF TURBINE ENDWALL HEAT TRANSFER. VOLUME 1: DESCRIPTION OF EXPERIMENTAL HARDWARE AND TEST CONDITIONS Final Report, 1 Aug. 1977 - 31 Aug. 1981
L. D. Hylton, M. S. Mihelc, E. R. Turner, and R. E. York Wright-Patterson AFB, Ohio AFWAL Aug. 1981 147 p ref 3 Vol.
(Contract F33615-77-C-2030; AF Proj. 3066)
(AD-A110332; DDA-EDR-10363-Vol-1; AFWAL-TR-81-2077-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 21/5

Two turbine cascades were tested at simulated engine conditions to provide a data base of endwall heat transfer data. This data base is intended to be sufficiently complete to provide verification data for refined computational models developed to predict first-stage stator endwall heat transfer in advanced turbine engines. A linear, two dimensional cascade provided the bulk of the data. This cascade provided data to separate the effects of exit Mach number, exit Reynolds number, inlet boundary layer thickness, gas-to-well temperature ratio, inlet pressure gradients, and inlet temperature gradients. In addition, adiabatic wall temperature and inlet turbulence intensity data are available for this linear cascade runs. A computerized data base was generated. This data base, with its associated software management system, provides the user with relatively easy access to the vast amount of data generated. A full annular, three dimensional cascade was used to acquire data for identifying the radial pressure gradient effects. Tests in the annular cascade were run over a wide range of exit Mach and Reynolds numbers and gas-to-wall temperature ratios, all at levels typical to advanced engines. The facilities, cascade geometry, instrumentation, and data acquisition techniques are discussed, as well as a summary of test conditions and a sample summary data set for both cascades. R.J.F.

N82-21200# Detroit Diesel Allison, Indianapolis, Ind.
EXPERIMENTAL INVESTIGATION OF TURBINE ENDWALL HEAT TRANSFER. VOLUME 2: LINEAR AND ANNULAR CASCADE SUMMARY DATA SETS Final Report, 1 Aug. 1977 - 31 Aug. 1981
L. D. Hylton, M. S. Mihelc, E. R. Turner, and R. E. York Wright-Patterson AFB, Ohio AFWAL Aug. 1981 329 p 3 Vol.
(Contract F33615-77-C-2030; AF Proj. 3066)
(AD-A110333; DDA-EDR-10363-Vol-2; AFWAL-TR-81-2077-Vol-2) Avail: NTIS HC A15/MF A01 CSCL 21/5

Two turbine cascades were tested at simulated engine

conditions to provide a data base of endwall heat transfer data. This data base is intended to be sufficiently complete to provide verification data for refined computational models developed to predict first-stage stator endwall heat transfer in advanced turbine engines. Summary plots of the results of both the linear and the annular cascade test programs are given. The data is sufficient to allow the designer to estimate the endwall cooling levels and to locate areas of high heat transfer rates. R.J.F.

N82-21201# Detroit Diesel Allison, Indianapolis, Ind.
EXPERIMENTAL INVESTIGATION OF TURBINE ENDWALL HEAT TRANSFER. VOLUME 3: DATA BASE SYSTEM Final Report, 1 Aug. 1977 - 31 Aug. 1981
L. D. Hylton, M. S. Mihelc, E. R. Turner, and R. E. York Wright-Patterson AFB, Ohio AFWAL Sep. 1981 61 p 3 Vol.
(Contract F33615-77-C-2030; AF Proj. 3066)
(AD-A110334; DDA-EDR-10363-Vol-3; AFWAL-TR-81-2077-Vol-3) Avail: NTIS HC A04/MF A01 CSCL 21/5

Two turbine cascades were tested at simulated engine conditions to provide a data base of endwall heat transfer data. This data base is intended to be sufficiently complete to provide verification data for refined computational models developed to predict first-stage stator endwall heat transfer in advanced turbine engines. A linear, two dimensional cascade provided the bulk of the data. This cascade provided data to separate the effects of exit Mach number, exit Reynolds number, inlet boundary layer thickness, gas-to-wall temperature ratio, inlet pressure gradients, and inlet temperature gradients. In addition, adiabatic wall temperature and inlet turbulence intensity data are available for the linear cascade runs. A computerized data base was generated. This data base, with its associated software management system, provides the user with relatively easy access to the vast amount of data generated. A full annular, three dimensional cascade was used to acquire data for identifying the radial pressure gradient effects. Tests in the annular cascade were run over a wide range of exit Mach and Reynolds number and gas-to-wall temperature ratios, all at levels typical of advanced engines. A user's manual is presented. R.J.F.

N82-21202# Department of Energy, Bartlesville, Okla. Energy Technology Center.
THERMODYNAMICS OF ORGANIC COMPOUNDS Final Technical Summary Report, 1 Oct. 1980 - 30 Sep. 1981
N. K. Smith, B. E. Gammon, and William D. Good 1981 24 p refs
(Grant AF-AFOSR-ISSA-00013-81; AF Proj. 2308)
(AD-A110430; AFOSR-82-0023TR) Avail: NTIS HC A02/MF A01 CSCL 21/5

The research effort continues to be focused on high density/high energy hydrocarbons. In cooperation with researchers at Wright-Patterson Air Force Base, heats of combustion are measured for constituents of current ramjet fuels and for finished fuels; meanwhile, pure hydrocarbons are synthesized for heat-of-combustion measurement whose unusual steric or strain energies may contribute to design of high energy/high density fuels of the future. Four pure hydrocarbons studied were selected among the alkylnaphthalenes and indans that may exhibit unusual steric energies. One unusual hydrocarbon, with very high density and a cage-like molecular structure, was also studied. This substance is undergoing preliminary testing as an experimental fuel. Synthesis and purification of hydrocarbons for future study are in progress at Oklahoma State University. New equipment and procedures were developed for application of the differential scanning calorimeter on measurements of heat capacity of fuels and their constituents. Preparation is underway to study the heat of combustion of several special liquid hydrocarbon fuels. GRA

N82-21203# United Technologies Research Center, East Hartford, Conn.
RESEARCH ON TURBINE ROTOR-STATOR AERODYNAMIC INTERACTION AND ROTOR NEGATIVE INCIDENCE STALL Final Report, Mar. 1979 - Nov. 1981
R. P. Dring, H. D. Joslyn, L. W. Hardin, and J. H. Wagner Wright-Patterson AFB, Ohio AFWAL Nov. 1981 107 p refs
(Contract F33615-80-C-2008; AF Proj. 3066)
(AD-A110341; UTRC/R81-915048; AFWAL-TR-81-2114) Avail: NTIS HC A06/MF A01 CSCL 20/4

The aerodynamic interaction between the rotors and stators of a large scale axial turbine stage have been studied experimentally. The data included measurements of the time averaged and instantaneous surface pressures and surface thin film gage output on both the rotor and stator at midspan. The data also included measurement of the stator suction and pressure surface time averaged heat transfer at midspan. The data was acquired with rotor-stator axial gaps of 15% and 65% of axial chord. The upstream potential flow influence of the rotor on the stator was seen as well as the downstream potential flow and wake influences of the stator on the rotor. The second phase of the program was an investigation of the nature of the full-span steady flow over the rotor with incidence varying up to negative incidence stall. Full-span pressure distributions and surface flow visualization were acquired over the entire range of incidence. The data indicated separation-free flow and large radial flows on the pressure surface in the vicinity of design incidence. GRA

N82-21204# Rolls-Royce Ltd., Derby (England). Aero Div.
COATINGS IN THE AERO GAS TURBINE
R. H. Wedge and A. V. Eaves 1980 12 p ref
(PNR-90049) Avail: NTIS HC A02/MF A01

The types of sprayed coatings used are defined, and coating requirements for each section of the gas turbine engine are discussed. Main problem areas are defined as hammer wear at compressor blade (snubber) abutment faces, and turbine blade shroud abutment faces; fretting wear particularly of compressor blade and vane roots rubbing and vane roots rubbing and sliding wear in various applications; the requirement to maintain clearances in gas path seals; and the effects of overheating and thermally cycling turbine parts, particularly rotor blades. The need to restore deliberately overmachined and accidentally overmachined parts is also discussed. Factors to be considered in coating selection are described with particular reference to the application requirements, the types of coating that might be used, and coatings that have proved to give the best results. The relationship between coating performance and cost effectiveness is illustrated with examples. Author (ESA)

N82-21205# Rolls-Royce Ltd., Derby (England).
PROCESS DEVELOPMENT AND EVALUATION OF GAS TURBINE ENGINE COMPONENTS IN IMI 829
R. M. Duncan (IMI Kynoch Ltd.), R. E. Goosey (IMI Kynoch Ltd.), R. H. Jeal, and P. J. Postans 1980 12 p refs
(PNR-90050) Avail: NTIS HC A02/MF A01

Measurements of basic physical properties and mechanical property evaluation of a range of typical gas turbine parts were performed on this titanium alloy (Ti-Al-Sn-Zr-Nb-Mo-Si). It is a near-alpha alloy. It has a density of 4.54 g/cu cm and the alpha + beta/beta transformation temperature is nominally 1015 C. Tensile tests of disk and ring forgings show that: at 20 C the 0.2% proof stress is 30 MPa lower than for IMI 685, but both alloys have similar strength at 540 C. Tensile strength is unaffected by forging route and microstructure, but tensile ductility tends to improve as the grain size decreases. The test results show some scatter but at 20 C the average elongation is 13% with the finest grain size and 8% for the coarsest grain size, and at 540 C the elongations are 15% and 11%, respectively. Creep strength is 20 C superior to IMI 685. Fracture toughness is similar to IMI 685 as are crack growth rates. Author (ESA)

N82-21206# Rolls-Royce Ltd., Derby (England).
THE TESTING AND APPROVAL OF AIRCRAFT ENGINE MOUNTED ACCESSORIES
D. S. Pearson 1980 21 p ref
(PNR-90051) Avail: NTIS HC A02/MF A01

Measurement techniques, data assessment criteria, physical interpretation and laboratory simulation methods applicable to accessory vibration testing are reviewed. The inadequacies of endurance approval testing of accessories by applying undirectional single frequency excitation to simulate engine conditions at a particular shaft speed are shown. A measurement and assessment technique is described which recognizes the effect of multifrequency vibration in three planes. An experimental specification for accessories, based on the technique, is outlined. Case histories of vibration induced accessory failure are cited. Author (ESA)

N82-21207# Rolls-Royce Ltd., Derby (England).
DEVELOPMENTS TO IMPROVE THE NOISE AND COMBUSTION EMISSIONS ON THE FOKKER F28 AIRCRAFT AND ITS ROLLS-ROYCE RB183-555 ENGINES. SECTION 1: DEVELOPMENT OF THE NEW INTERNAL 10-LOBE MIXER
S. L. Sarin (Royal Netherlands Aircraft Factories Fokker), K. Goddard, and N. J. Wilson 1981 15 p
(PNR-90061) Avail: NTIS HC A02/MF A01

Theoretical and practical aspects of exhaust mixer design for turbofan engines are discussed. The effects on fuel consumption and noise reduction of annular and multilobed internal mixers are compared. The production version of a multilobed mixer is described. The lobed mixer reduces total noise by 5.75 dB A and fuel consumption by 4%. The development trends of exhaust mixers, with particular reference to high bypass ratio engines are also discussed. Author (ESA)

N82-21208# Rolls-Royce Ltd., Derby (England).
ENGINES FOR AIR TRANSPORT
A. G. Newton 1981 52 p
(PNR-90066) Avail: NTIS HC A04/MF A01

The status and trends of commercial aircraft transportation systems were reviewed. The characteristics and specific consumption of aviation fuel are emphasized. It is shown that in the next 15 years the fuel consumption of current large fan engines can be reduced by 15%. The quality of fuel will deteriorate relative to today, which will place greater demands on engine design. Further improvements in fuel economy using engines designed for lower specific thrust appear feasible. The development of a full authority digital control system and its effects on fuel consumption are also discussed. Author (ESA)

N82-21209# Rolls-Royce Ltd., Derby (England).
ALLOWING FOR THE WALL BOUNDARY LAYER IN A STAGE OF AN AXIAL COMPRESSOR
N. S. Berestneva, N. A. Kocal, F. G. Kontsevich, and Y. G. Otsechkin Jan. 1981 9 p refs Transl. into ENGLISH from Samoletostr. Tekh. Vozdush. Flota (USSR), no. 43, 1978 p 51-54 In ENGLISH and RUSSIAN
(PNR-90067; Trans-15546; TLT-00815) Avail: NTIS HC A02/MF A01

The geometric characteristics of the tested stage and the grid parameters are given. The coefficient of adiabatic pressure of the stage is taken as 0.26 at a coefficient of consumption of 0.447. The stage is a model of the initial stage of a high pressure compressor. The operation of the stage in the calculated field of input speeds leads to a 3.5 % increase in its maximum efficiency with no influence upon the limit of its operational stability. Author (ESA)

N82-21210# Rolls-Royce Ltd., Derby (England). Noise Technology Div.
THE ROLLS ROYCE ROLE IN AIRCRAFT NOISE REDUCTION
M. J. T. Smith 8 Sep. 1981 17 p refs Submitted for publication
(PNR-90069) Avail: NTIS HC A02/MF A01

Jet turbomachinery, pressure, combustion and aerodynamic noise sources are discussed. General features of reasearch organization and current projects (RBZU-524, RB711-535, RJ500) are outlined. Engine development costs often lead to an emphasis on adopting existing products to new and altered airframes. Author (ESA)

N82-21211# Rolls-Royce Ltd., Derby (England). Dept. of Engineering.
THE MECHANICAL TESTING OF COMPRESSORS AND TURBINES FOR AIRCRAFT GAS TURBINE ENGINES
D. Norris 1981 12 p
(PNR-90070) Avail: NTIS HC A02/MF A01

Ten different engine types, including the RB211 family of engines, and both civil and military applications, are considered. Overspeed, fatigue, bird ingestion, and blade containment are described. Author (ESA)

N82-21212# British Aerospace Aircraft Group, Weybridge (England).
SIMULATION OF TURBOFAN ENGINE MODELS IN THE WEYBRIDGE LOW SPEED WIND TUNNEL
R. F. R. Storey Jun. 1981 7 p
(BAe-Inform-Note-46) Avail: NTIS HC A02/MF A01

A control arrangement for the gas supply to a low speed wind tunnel is suggested. Clean dry nitrogen gas at up to 1500 lb/sq in and 90 C is supplied from a mobile dispenser at 4.2 lb/sec. Gas pressure is reduced to 400 lb/sq in and drives two model turbofan engines. The flow from the dispenser into the models is controlled by servovalves operating hydraulically from pressure transducer signals. Materials and supply sources are listed. Author (ESA)

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N82-21213# Aeronautical Research Labs., Melbourne (Australia).
THE STABILITY OF PORTABLE BRIDGES CARRIED ON SLINGS BENEATH HELICOPTERS
N. Matheson Jan. 1980 56 p refs
(ARL/Aero-Rept-154; AR-001-787) Avail: NTIS HC A04/MF A01

Information available concerning the operation of helicopters carrying airportable bridges is reviewed. In addition, a series of wind tunnel tests were made with 1/15 scale models to determine the maximum safe speed for a helicopter carrying two different class 16 bridges, a 16 m (52 ft) clear span, and a 22 m (72 ft) raft, separately on a single hook. The tests indicated that the 16 m (52 ft) bridge can be carried safely at speeds up to 65 knot on a 16 m (53 ft) cable, provided it was slung 5 deg nose up in the static condition, and two small flat fins were attached to the aft end. The raft was carried in two loads, A and B, because of weight limitations. Load A, which consisted mainly of deck boxes and accessories, can be safely carried without fins at speeds up to 60 knot on a 16 m (53 ft) cable provided it was rigged 1 to 2 deg nose up. Load B, which consisted of four ramps and four articulators, can also be carried at 60 knot, but small flat fins were required and it had to be slung 5 deg nose up and carried on a 10 m (33 ft) cable. S.L.

N82-21214# Princeton Univ., N. J. Dept. of Mechanical and Aerospace Engineering.
DIGITAL COMMAND AUGMENTATION FOR LATERAL-DIRECTIONAL AIRCRAFT DYNAMICS Annual Technical Report, 1 Feb. 1979 - 31 Jan. 1980
David Atzhorn Arlington, Va. ONR May 1981 199 p refs (Contract N00014-78-C-0257; NR Proj. 300-003)
(AD-A110274; MAE-1511; ONR-CR-300-003-2) Avail: NTIS HC A09/MF A01 CSCL 01/2

Linear-quadratic sampled-data regulator theory is used to design several Type 0 and Type 1 control laws for lateral-directional aircraft dynamics. Control structures are defined for singular command inputs and for control rate outputs; the former allows for precise following of a command whose integral appears in the state vector, while the latter uses both a difference approximation and the Tustin transform to characterize control rate in the discrete-time domain. Type 0 controllers with control rate restraint and equivalent Type 1 controllers are implemented in a microprocessor-based digital flight control system, and flight tests are conducted using Princeton University's Variable-Response Research Aircraft. The control system, entitled CAS-4, offers four combinations of control: direct (unaugmented) control, Type 0 control with both roll rate/sideslip angle and roll rate/lateral acceleration command combinations, and Type 1 control with roll/sideslip angle command. Ground-based hybrid simulation and flight test results show that major closed-loop response features are unaffected by the choice of sampling rate when sampled-data regulator theory is used. Consequently, much lower sampling rates than would normally be expected can be used when control laws are derived in this manner. GRA

N82-21215# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).

INFLUENCE OF STRAKES ON COEFFICIENTS OF LONGITUDINAL STABILITY Thesis - Tech. Univ., Munich [EINFLUSS VON STRAKES AUF DIE BEIWERTE DER LAENGSBEWEGUNG]

Gerhard Wolfrum 20 Dec. 1979 190 p refs In GERMAN (MBB-FE-122/S/PUB/22) Avail: NTIS HC A09/MF A01

In a subsonic wind tunnel the influence on the longitudinal stability of seven different strakes mounted on five basic wings was measured. Size of the strake and lift are directly related, while the aerodynamic drag is determined by the basic wing. The importance of pitch is influenced by the strake in relation with the lift. The efficacy of right strakes on more or less swept back wings against buffeting is particularly strong in the subsonic area. In general, strakes do not influence substantially the outline of the aerodynamic configuration, but their size remains the most important single parameter to obtain longitudinal stability. Author (ESA)

N82-21216# Royal Aircraft Establishment, Farnborough (England).

SOME REMARKS ON BUFFETING

D. G. Mabey Feb. 1981 35 p refs Presented at Von Karman Inst. for Fluid Dyn. Lecture Ser. on Unsteady Airloads and Aeroelastic Probl. in Separated and Transonic Flows, Brussels, 10 Mar. 1981

(RAE-TM-Struct-980; BR78530) Avail: NTIS HC A03/MF A01

Buffeting is defined as the structural response to the aerodynamic excitation produced by separated flows. The aerodynamic excitation produced by bubbles, vortices and transonic flows is discussed. Different buffeting criteria for the wings of fighter and transport aircraft are developed. Methods of predicting the onset and severity of buffeting are reviewed. Typical examples are discussed, in which improvements in wing buffeting are compared with changes in mean force measurements. Buffeting measurements on ordinary models in a cryogenic wind, wind tunnel are analyzed. The measurements confirm that cryogenic tunnels can separate Reynolds number and aeroelastic effects. The frequency parameter must be correct on the model if the aerodynamic excitation does not have a flat spectrum, as at vortex breakdown on a slender wing. Author (ESA)

N82-21217# Royal Aircraft Establishment, Farnborough (England). Structures Dept.

THE APPLICATION OF SUBSONIC THEORETICAL AERODYNAMICS TO ACTIVE CONTROLS

H. C. Garner May 1981 84 p refs

(RAE-TR-81060; RAE-Struct-BF/B/0860; BR80082) Avail: NTIS HC A05/MF A01

Aerodynamic forces for wing and control surface motion with general time dependence in linearized subsonic flow were analyzed. The time domain where quasisteady displacement and rate terms are combined with a residual history term is discussed. An accurate calculation procedure is devised, and results are illustrated for a high respect ratio wing at Mach number 0.8 with trailing edge, leading edge and all moving tip controls. Asymptotic behavior at small and large times and individual control characteristics are compared. The quasisteady approximation is established for hinge moments and is analyzed for lift. The rapid lift response to leading edge control and the sluggish lift response to trailing edge control are explained. The forces in the time domain are confirmed by Fourier transform calculations in the frequency domain, which shows the extent to which the range of frequency can be truncated. The control surface motion to produce a known time dependent force is determined. Author (ESA)

N82-21218# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Aircraft Div.

VIBRATION QUALIFICATION OF EXTERNAL AIRCRAFT STORES AND EQUIPMENT

M. Steininger and G. Haidl 7 Sep. 1981 17 p refs Presented at 53rd AGARD Struct. and Mater. Panel Meeting, Noordwijkerhout, Netherlands, 27 Sep. - 2 Oct. 1981

(MBB-FE-173/S/PUB/46) Avail: NTIS HC A02/MF A01

Prediction methods for preliminary assessment of aircraft vibration levels and spectra are described. A dynamic environment simulation for external stores configuration tests is discussed. Standard mounting and excitation techniques are reviewed and mounting rig requirements and shaker capabilities are treated. It is shown that trends in aircraft structural design and operational requirements result in increasing vibration problems. Author (ESA)

N82-21219# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriebsbereich.

DYNAMIC RESPONSE OF A HOT GAS, CONTROL-SURFACE ACTUATOR

Erwin Goellner 1981 72 p refs Reprint from J. of Flight Sci. and Space Res. (Cologne), v. 5, no. 4, Jul./Aug. 1981 p 209-216 In GERMAN; ENGLISH summary Presented at 4th Aachener Fluidtech. Kolloq., Aachen, Mar. 1980

(MBB-UA-599/81-OE; ISSN-0342-068X) Avail: NTIS HC A04/MF A01

The operation of a control surface actuator and its steady state valve characteristics are examined. The linearized transfer functions are calculated under simplified assumptions. Suitable parameters are defined and their influence on the stability of the closed loop is discussed. The response of the closed position control loop is demonstrated. Author (ESA)

N82-21220# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Flugzeuge-Entwicklung.

THEORETICAL LINEAR APPROACH TO THE COMBINED MAN-MANIPULATION SYSTEM IN MANUAL CONTROL OF AN AIRCRAFT

Klaus Brauser 2 Jun. 1981 17 p refs Presented at 17th Ann. Conf. on Manual Control, Los Angeles, 16-18 Jun. 1981 (MBB-FE-301/S/PUB/43) Avail: NTIS HC A02/MF A01

The dynamic characteristics of the pilot control system are studied with a model combining the neuromuscular properties of the man with the physical properties of the control system. The man is assumed to be a quasilinear, time invariant control operator adapted to the operating states of the control system. The frequency domain transfer functions of the man control system and the closed loop pilot aircraft control system are posed. The complete precision man control model must be introduced into the closed loop transfer function to understand standard handling criteria and to derive these criteria directly from human operator properties. Author (ESA)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

N82-21221*# National Aeronautics and Space Administration, Washington, D. C.

GRADIENT HEATING FACILITY. EXPERIMENT CARTRIDGES. DESCRIPTION AND GENERAL SPECIFICATIONS

J. Breton Feb. 1982 163 p Transl. into ENGLISH of "Gradient Heating Facility. Expt. cartridges. Description et Specificatons Gen." Toulouse, no. 062 CT/SC/M B, rev. 2, Nov. 1981 45 p Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Centre Natl. d'Etudes Spatiales

(Contract NASw-3541)

(NASA-TM-76800; NAS 1.15:76800) Avail: NTIS HC A08/MF A01 CSCL 14B

Specifications that define experiment cartridges that are compatible with the furnace of the gradient heating facility on board the Spacelab are presented. They establish a standard cartridge design independent of the type of experiment to be conducted. By using them, experimenters can design, construct, and test the hot section of the cartridge, known as the high temperature nacelle. R.J.F.

N82-21222# AAI Corp., Cockeysville, Md. Aeronautical Systems Div.

MINUTES OF PHYSICAL CONFIGURATION AUDIT FOR THE F-16 ELECTRONIC WARFARE TRAINING DEVICE
Dec. 1981 54 p
(Contract F33657-79-C-0820)
(AD-A110321; AAI-ER-11613) Avail: NTIS HC A04/MF A01 CSCL 05/9

A physical configuration audit (PCA) of the F-16 electronic warfare training device was conducted. The purpose was to conduct a formal examination of the built version of the simulator against the technical engineering drawings to establish the simulators product baseline. E.A.K.

N82-21223# Air Force Human Resources Lab., Brooks AFB, Tex.
THE 1981 IMAGE 2 CONFERENCE PROCEEDINGS Final Report
Eric G. Monroe, comp. Nov. 1981 508 p refs Proceedings Held at Brooks AFB, Texas, 10-12 Jun. 1981
(AF Proj. 9983)
(AD-A110226; AFHRL-TR-81-48) Avail: NTIS HC A22/MF A01 CSCL 14/2

These proceedings are a collection of papers presented at the 1981 Image Generation/Display Conference 2. The Image Conference is devoted to issues relevant to the development and use of imagery generated and displayed for visual flight simulation. The purpose of the conference is to provide a forum for presenting and discussing topics concerned with the imagery generated for out of the cockpit and sensor visual flight simulation. The 31 papers presented were compatible with the theme of the conference, including both engineering research/development and behavioral research. In the engineering area, papers covered such topics as computer simulated forward looking infrared and low light level television imagery, computer image generation (CIG) texturing of curved surfaces, shuttle mission simulation, nap of the Earth flight simulation, light valve projectors, lasers in simulation, area of interest displays, tactical combat simulation, sensor simulation, and helmet-mounted displays. Topics in behavioral research included such items as effects of visual and motion cues, identification of targets in CIG displays, psychophysical aspects of visual processing, visual illusions, visually induced self motion, determination of visual cue requirements, visual data base development for terrain flight simulation, transformation realism, and strategies to optimize CIG image content. GRA

N82-21224# Mitre Corp., McLean, Va. Metrek Div.
OVERVIEW OF THE O'HARE RUNWAY CONFIGURATION MANAGEMENT SYSTEM
Richard L. Fain Sep. 1981 52 p refs
(Contract DTFA01-81-C-10001)
(AD-A110137; MTR-81W235; FAA-EM-82-5) Avail: NTIS HC A04/MF A01 CSCL 17/7

The O'Hare Runway Configuration Management System (CMS) is an interactive computer algorithm designed to assist the Assistant Chief of the O'Hare facility in selecting runway configurations which minimize delay. The current version of CMS utilizes a full screen input/output structure to enhance near-term implementation within O'Hare's manual ATC environment. This paper presents an overview of the runway selection logic (including the impacts of transitioning between configurations and balancing demand) and describes the system hardware configuration and the functional responsibilities of the participants in the O'Hare application. The historical development of CMS, future potential enhancements in system logic and system implementation, and application of CMS at other airports are also discussed. Author (GRA)

N82-21225# Lincoln Lab., Mass. Inst. of Tech., Lexington
MATERIALS, PROCESSES AND TESTING LABORATORY RESIDENTIAL TECHNICAL PROGRESS REPORT Progress Report, Mar. - Jun. 1981
S. E. Forman and M. P. Themelis 31 Aug. 1981 29 p ref
(Contract DE-AC02-76ET-20279)
(DE82-002816; DOE/ET-20279/151) Avail: NTIS HC A03/MF A01

Performance measurements are reported for prototype photovoltaic modules in various residential applications in the Northeast, in New Mexico, in Florida and in Hawaii. Current-voltage characteristics were measured and the dependence of power delivered upon cell temperature was measured. Failure analysis of high leakage current modules, visual examination results of modules at the Northeastern and New Mexico sites, and examination of photovoltaic/thermal liquid collectors are presented. T.M.

N82-21226# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Flugzeuge.
THEORETICAL AND EXPERIMENTAL INVESTIGATIONS OF WIND TUNNEL INTERFERENCE DUE TO ANGLE OF ATTACK
Norbert Gruen 29 Aug. 1980 145 p In GERMAN; ENGLISH summary
(MBB-FE-124/S/PUB/34) Avail: NTIS HC A07/MF A01

Using wall pressure measurements, recorded simultaneously with model tests, corrections for model surface pressures are calculated. The difference between experimental wall pressure coefficients and computed free flight pressure coefficient distributions is used as a criterion for the wall interference on the tunnel flow. An evaluation of the wall pressure curves shows that their general shape is predetermined by the empty tunnel and the model support, respectively. Increasing the model angle of attack primarily causes a shift and a change in the gradient of these curves. The calculated free flight pressure coefficients are found to be very small compared to measured values. In order to find the pressure coefficient differences along the tunnel axis, a flow model is established which shows the previously computed differences in pressure coefficients on an imaginary wall at the location of the tunnel wall. The propagation of these disturbances to the tunnel axis is calculated using the finite element method. Results are used to correct measured coefficients for lift, drag and pitching moment. Author (ESA)

N82-21227# Royal Aircraft Establishment, Farnborough (England).
MEASUREMENTS OF THE DYNAMIC PERFORMANCE OF THE MAIN DRIVE FAN OF THE RAE 5 METER PRESSURIZED LOW SPEED WIND TUNNEL
R. W. Jeffrey London HMSO Apr. 1980 59 p refs
(RAE-TR-80043; REA-AERO-3478; BR76275) Avail: NTIS HC A04/MF A01

A technique for in situ maintenance checking to detect the onset of internal cracking or delaminarization in glass reinforced plastic blades was developed. Three of the ten fan blades were instrumented with strain gages to monitor the dynamic performance of the fan under different loadings resulting from combinations of fan speed and tunnel pressurization. A wind tunnel model was also placed in the test section. At 64, 80, 176, 211, and 300 rpm the flapping modes are excited, at 201 rpm the torsion modes respond, and at 112 rpm both modes respond. Results are so consistent that incipient damage will show up as a marked change in the frequency of one of more of the basic modes of vibration. Introduction of the model increases the pressure and hence the level of response. However, the increased aerodynamic loading introduces extra damping and the resonant conditions are suppressed at higher tunnel pressures. Author (ESA)

N82-21228# Royal Aircraft Establishment, Farnborough (England).
AN AUTOMATIC WAKE-TRAVERSE SYSTEM FOR FLOW-FIELD MEASUREMENTS IN LARGE LOW-SPEED WIND TUNNELS
D. A. Lovell London HMSO 3 Jun. 1980 86 p refs
(RAE-TR-80078; RAE-Aero-3487; BR77762) Avail: NTIS HC A05/MF A01

The development of a computer controlled system for making extensive measurements of flow fields in low speed wind tunnels is described. The nature and operation of the principal hardware components, a Cartesian traverse system, a velocity vector measurement system, and the interfaces to allow control of these devices by a computer, are outlined. The control unit for driving the Cartesian system is based on the type of device used for driving numerically controlled machine tools. A five tube pressure measurement probe is attached to a moveable quadrant which can be rotated about the X axis. Voltages related to probe tube pressures are used in a closed loop servomechanism to drive the quadrant and roll motions until the probe is aligned

with the local flow direction. A PDP-11 computer is used for control, data acquisition and data processing. The system can make 100 measurements of flow vectors per hour. Author (ESA)

N82-21229# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Apparate.
COMPUTER GENERATED IMAGES FOR AIRCRAFT PILOT TRAINING
P. Gueldenpfennig and W. Metze 3 Nov. 1980 19 p refs
(MBB-UA-551/80-OE) Avail: NTIS HC A02/MF A01

The various training tasks envisaged for full mission simulation with a prototype visual system are described and the performance of the system evaluated. The upgrading of the system resulting from this evaluation, and its implementation in the operational simulators, are discussed. Deficiencies were noted in the following areas: scene content due to the limited real time edge processing capability, for the training of ground attack, and takeoff/landing; scene content due to the limited online data base for the training of en route flying; and resolution due to the number of TV lines and raster elements per TV line for the training of ground attack and air-to-air-combat. Author (ESA)

N82-21141*# McDonnell-Douglas Electronics Co., St. Charles, Mo.
METEOROLOGICAL INPUTS TO ADVANCED SIMULATORS
Gordon O. Handberg *In* NASA. Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Dec. 1981 p 21-25 refs (For primary document see N82-21139 12-01)
Avail: NTIS HC A07/MF A01 CSCL 14B

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N82-21230*# National Aeronautics and Space Administration, Washington, D. C.
LIMITING FLOWS OF A VISCOUS FLUID WITH STATIONARY SEPARATION ZONES WITH Re APPROACHING INFINITY
G. I. Taganov Jan. 1982 24 p refs Transl. into ENGLISH of Uch. Zap. TsAGI (USSR), v. 1, no. 3 p 1-14 Translation was announced as A71-29204 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-76658; NAS 1.15:76658) Avail: NTIS HC A02/MF A01 CSCL 20D

The limiting flows of a viscous noncondensable fluid, which are approached by flows with stationary separation zones behind planar symmetrical bodies, with an unlimited increase in the Reynolds number are studied. Quantitative results are obtained in the case of a circulation flow inside of a separation zone. B.W.

N82-21231*# National Aeronautics and Space Administration, Washington, D. C.
INSAT-1A LAUNCH ON DELTA
[1982] 24 p
(NASA-TM-84159; NAS 1.15:84159; Rept-0-492-214-82-1) Avail: NTIS HC A02/MF A01 CSCL 22A

The INSAT-1A, the first in a series of 12 transponder communications satellites developed for India, is described as well as the launch plans. The launch vehicle will be the Delta 3910 configuration which incorporates an extended long tank Thor booster, nine Castor IV strap-on motors, a TR-201 second stage, and an 8 foot fairing. The satellite will be placed in a suborbital trajectory. A DAM-D stage will then thrust it into a synchronous transfer orbit. An apogee kick motor will be fired to circularize its orbit at a geosynchronous altitude of 19,300 nautical miles. R.J.F.

N82-21232*# Arizona Univ., Tucson. Engineering Experiment Station.
HORMONE PURIFICATION BY ISOELECTRIC FOCUSING IN SPACE Progress Report, 29 Mar. 1980 - 28 Mar. 1981
Milan Bier 26 Jan. 1982 92 p refs
(Contract NAS8-32950)
(NASA-CR-161987; NAS 1.26:161987) Avail: NTIS HC A05/MF A01 CSCL 22A

The performance of a ground-prototype of an apparatus for recycling isoelectric focusing was evaluated in an effort to provide technology for large scale purification of peptide hormones, proteins, and other biologicals. Special emphasis was given to the effects of gravity on the function of the apparatus and to the determination of potential advantages deriveable from its use in a microgravity environment. A theoretical model of isoelectric focusing sing chemically defined buffer systems for the establishment of the pH gradients was developed. The model was transformed to a form suitable for computer simulations and was used extensively for the design of experimental buffers. A.R.H.

N82-21233*# National Aeronautics and Space Administration, Washington, D. C.
THE SPACE LABORATORY: A EUROPEAN-AMERICAN COOPERATIVE EFFORT
Hans E. W. Hoffmann Dec. 1981 15 p Transl. into ENGLISH from Astronautik (West Germany), v. 11, no. 2, 1974 p 40-44 Translation was announced as A74-34520 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original prep. by ERNO Raumfahrttechnik G.m.b.H., Bremen
(Contract NASw-3199)
(NASA-TM-76657; NAS 1.15:76657) Avail: NTIS HC A02/MF A01 CSCL 22B

A review of the history of the European participation in the American space shuttle project is presented. Some early work carried out in West Germany on the rocket-powered second state of a reusable launch vehicle system is cited, in particular wind tunnel studies of the aerodynamic and flight-mechanical behavior of various lifting body configurations in the subsonic range. The offer made by the U.S. to Europe of participating in the space shuttle program by developing a reusable launch vehicle is discussed, noting West Germany's good preparation in this area, as well as the ultimate decision of the U.S. to exclude Europe from participation in the design of the Orbiter and the booster stage of the shuttle. R.J.F.

N82-21234# European Space Agency, Paris (France).
REFLECTIONS ON THE ECONOMICS OF THE EUROPEAN SPACE PROGRAM
J. A. Vandenkerckhove Jan. 1981 84 p refs
(ESA-STR-207; ISSN-0379-4067) Avail: NTIS HC A05/MF A01; ESA, Paris FF 55

The budgetary implications to the European space community of large-scale projects made possible by the payload capabilities of ARIANE and SPACELAB are assessed. The effect of spacecraft size on the economic justification of later ARIANE models is treated, emphasizing a response to the requirements of payload activities. Beyond scale, more efficient programs which achieve an appreciable improvement in the economy of space projects, at least those in low Earth orbit, are considered. These are essentially SPACELAB, a multimission platform, and the possibilities derived from spacecraft recovery, all three requiring the use of the STS or an equivalent shuttle capability. The savings to be expected from these approaches and the extent to which they can be applied to ARIANE is shown. This is needed in order both to compare the economy of SPACELAB with that of expendable satellites, and to provide a basis for assessing the desirability of developing new capabilities in Europe. Author (ESA)

N82-21235# European Space Agency, Paris (France). Materials Sciences Working Group.
CHALLENGES AND PROSPECTS OF MICROGRAVITY RESEARCH IN SPACE
Yves Malmejac, A. Bewersdorff, I. DaRiva, and L. G. Napolitano Oct. 1981 83 p refs
(ESA-BR-05; ISSN-0250-1589) Avail: NTIS HC A05/MF A01; ESA, Paris FF 80 Member States and AU, CN and NO (-20% others)

The benefits to materials science of spaceborne microgravity research are outlined and case studies are presented. Surface

tension, hydrostatics, macroscopic particle motion in fluids, fluid-fluid interfaces and solid-liquid interfaces are discussed. Investigations of planar front crystallization, multiphase systems, combustion, and jets show that surface and contact line phenomena can acquire greater importance, natural convection in fluids can be greatly reduced in configurations that imply temperature or concentration gradients, and the possibilities for containerless positioning are enhanced since it can be achieved with low intensity compensating forces. Drawbacks include lack of specialized equipment, the extensive planning needed, lack of flexibility, and data acquisition limitations, e.g., thermal sensors are less accurate than on Earth. Author (ESA)

N82-21236# National Academy of Sciences - National Research Council, Washington, D. C.

THE INTERNATIONAL SOLAR POLAR MISSION: A REVIEW AND ASSESSMENT OF OPTIONS Final Report

Allen E. Puckett Sep. 1981 35 p refs

(PB82-137167) Avail: NTIS HC A03/MF A01 CSCL 22B

The international solar polar mission (ISPM) which required two spacecraft's to monitor the Sun while traveling in opposite directions in orbits passing over the poles was suspended. Two types of scientific investigations were planned: in situ measurements of particles and fields by instruments on both spacecraft, and visible, X-ray, and extreme ultraviolet imaging by instruments on the NASA spacecraft. Scientific merits of five ISPM alternatives; including the original mission, along with relative-costs of each were assessed. It was stressed that the original mission represented 'a powerful scientific investigation', but noted even a single probe would represent 'a pioneering exploration' far out of the ecliptic plane of the Sun. GRA

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N82-21237# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Raumfahrt.

THRUSTERLESS VARIATION OF SPACE PROBE TRAJECTORIES IN THE GRAVITATIONAL FIELD OF A PLANET THROUGH REPEATEDLY SWINGING BY THE MOONS OF THE PLANET [ANTRIEBSLOSE AENDERUNG VON SONDENBAHNEN IM GRAVITATIONSFELD EINES PLANETEN DURCH WIEDERHOLTE VORBEIFLUEGE AN DEN MONDEN DES PLANETEN]

Heinrich Herbst 26 Feb. 1980 30 p refs In GERMAN

(MBB-UR-433/80-OE) Avail: NTIS HC A03/MF A01

In order to conserve on space probe fuel, a scheme for inducing alteration in the orbital elements of a spacecraft by playing on the gravitational fields of a planet and its moons is presented. The technique is based on a simplified model of motion for the moons and the probe. The moons are considered to be in a circular orbit on the equatorial plane of the planet. The calculation method is explained and demonstrated, taking a tour of the moons of Jupiter as an example. Author (ESA)

N82-21238# Deutsches Geodaetisches Forschungsinstitut, Munich (West Germany).

ON THE DECOMPOSITION IN LEAST SQUARES (WITH EXAMPLES OF ITS APPLICATION IN SATELLITE GEODESY)

Wojciech Pachelski Verlag der Bayerischen Akademie der Wissenschaften 1980 58 p refs

(Ser-A-91; ISSN-0065-5309; ISBN-3-7696-8174-6) Avail: NTIS HC A04/MF A01

Methods of decomposition are compared and analyzed to display their basic principles and properties, and to give more or less general rules for application of the particular method to a given estimation problem. The methods pertain to three types of least squares estimation: adjustment, filtering, and collocation. Phase, group, and sequential adjustments are presented, as are Kalman filtering and sequential collocation. Examples of applications from satellite geodesy are used to illustrate the different methods. Author (ESA)

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

N82-21239# General Electric Co., Philadelphia, Pa. Space Div.

SXTF DESIGN SUPPORT STUDY Final Report, 1 Apr. 1980 - 27 Feb. 1981

C. Allen, O. Allen, D. Gordon, G. Haverly, R. Nason, H. ODonnel, R. Shoulberg, R. Schmidt, and J. Peden 27 Feb. 1981 146 p refs

(Contract DNA001-79-C-0410; DNA Proj. G37-LAXY)

(AD-A110034; DNA-5672F) Avail: NTIS HC A07/MF A01 CSCL 14/2

The purpose of this study was to develop concepts and requirements to guide the development of DNA's Satellite X-ray Test Facility, SXTF. Emphasis was placed on evaluation of special concerns in those areas of the SXTF design which would directly influence a satellite manufacturer and potential user of such a facility. The evaluation and concept development was performed in seven areas: Satellite thermal environment; Satellite support system, Satellite survivability verification requirements; Satellite system testing; Vacuum test chamber design; Satellite powering, and Satellite communications. In each of these areas, recommendations are made based on previous satellite test experience which are relevent to the development and final design of the SXTF into a versatile combined effects system test facility for hardness verification. Author (GRA)

N82-21240# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany). Hauptabteilung Festigkeit, Konstruktion und Werkstoffe.

STUDY OF A SAFETY SYSTEM FOR A HYDRAULIC MULTIDEGREE OF FREEDOM VIBRATION FACILITY

Hahn, Merklinghaus, and Schmid Paris ESA 20 Mar. 1980 188 p refs

(Contract ESTEC-3807/78/NL-HP(SC))

(B-TF-998; ESA-CR(P)-1398) Avail: NTIS HC A09/MF A01

A general failure analysis of a servohydraulic test facility is performed. The network of an extensive electroservohydraulic safety system is developed on the basis of the concepts of online and standby redundancy which is capable of protecting the test facility and the payload from malfunctions. Essential parts of the dynamic and logic systems are treated theoretically. Representative failures are selected for a hardware test covering the effects of all serious system failures. A final version of an electrohydraulic safety system is described. A hydraulic system was constructed using switches to simulate pump failures and line breaks and tests of the safety system were conducted, showing satisfactory results. Results of the hardware test of the safety system are presented and discussed. The system ensures a smooth shutdown of the test facility whenever any of the representative failures occur. Author (ESA)

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N82-21241# Weapons Systems Research Lab., Salisbury (Australia).

THE USE OF A DEFLECTABLE NOSE ON A MISSILE AS A CONTROL DEVICE

K. D. Thomson May 1981 60 p refs

(WSRL-0211-TR; AR-002-583) Avail: NTIS HC A04/MF A01

Wind tunnel tests were carried out on a blunted ogive cylinder

with a deflectable nose at Mach numbers between 0.8 and 2.0. Although the results are subject to scale effects, the deflectable nose can find use as a missile control method. The results were applied to two missile configurations. For a long slender missile the deflectable nose produces nonlinear trim curves at subsonic speeds, approaching linearity at supersonic Mach numbers. Nevertheless, worthwhile trimmed incidences can be achieved. Although a deflectable nose on a 105 mm shell at subsonic speeds produces only relatively small normal force coefficients at trim, the trim curves are linear. When used for terminal control significant deviations in shell impact point are attainable. S.L.

N82-21242# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Raumfahrt.
ASCERTAINING THE DAILY LAUNCH WINDOW FOR A GEOSTATIONARY COMMUNICATION SATELLITE [ERMITTLUNG DES TAEGLICHEN STARTFENSTERS FUER EINEN GEOSTATIONAEREN NACHRICHTENSATELLITEN]
Rudolf Metzgar 26 Feb. 1980 19 p In GERMAN
(MBB-UR-431/80-OE) Avail: NTIS HC A02/MF A01

Limitations, related to solar aspect angle, which are dictated by thermal and energy supply requirements as well as by orbital position measurement criteria are considered. Furthermore, it is necessary that shadow periods do not exceed a given duration, while in the vicinity of the apogee there must be no shadow at all. Calculations are shown for a typical spin stabilized configuration. Although for no particular spacecraft, the results given can be taken as representative conditions for this class of problem.
Author (ESA)

N82-21243# European Space Agency, Paris (France).
FUTURE SPACE SEGMENT CONCEPTS FOR LOWER COST COMMUNICATION SATELLITE SYSTEMS
A. W. Preukschat (ESTEC, Noordwijk, Netherlands) Jan. 1981 28 p refs
(ESA-STM-217; ISSN-0379-4075) Avail: NTIS HC A03/MF A01

A comparison of three communication satellite system design concepts was made. Single or multisatellite per mission systems, the satellite cluster system, and a proposed European satellite assembly system (ESAS) were examined. It is shown that for sets of comparable mission requirement and procurement and operation conditions, satellite-cluster systems are cheaper than individual satellite systems, but require communication service integration of missions with at least three times the basic capacity of a single satellite per mission system. It is also shown that a satellite assembly system can be substantially less expensive than the equivalent cluster system and does not require operational mission integration of communication services. If commercial application on a world-wide scale is considered, a comparison between possible cost competitive non-European single-satellite and cluster systems and commercial communication satellites using the ESAS concept shows a clear advantage towards the latter.
Author (ESA)

N82-21244# Royal Aircraft Establishment, Farnborough (England). Space Dept.
THE GEOMETRY OF SATELLITE CLUSTERS
J. G. Walker 7 Jul. 1981 31 p refs
(RAE-TR-81084; RAE-SPACE-600; BR80086) Avail: NTIS HC A03/MF A01

Considerations affecting the choice of geometry for geosynchronous satellite clusters, the effectss of orbital perturbations and a possible need for spatial discrimination to allow reuse of intersatellite link frequencies is reported. Cluster configurations which involve satellite following, relative to the cluster center are: (1) a common elliptical path in the equatorial plane; (2) a common circular path tilted at 30 deg to the horizontal; and (3) separate elliptical paths in parallel vertical planes inclined to the equatorial plane. It is concluded that if spatial discrimination between intersatellite links is not required, a cluster composed of truly geostationary satellites with a small longitudinal separation is the best cluster.
Author (ESA)

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

N82-21245*# General Electric Co., Philadelphia, Pa. Space Div.
PRELIMINARY ANALYSIS OF A FLEXIBLE INSTRUMENT MOUNT FOR LARGE INSTRUMENTS ON THE SPACE SHUTTLE Final Report
20 Dec. 1978 128 p
(Contract NAS5-23412)
(NASA-CR-166787; NAS 1.26:166787) Avail: NTIS HC A07/MF A01 CSCL 22B

A flexible instrument mount for large instruments on the space shuttle is analyzed. Concepts for pointing instruments while in orbit, with weights up to 2000 Kg and dimensions of 2 to 3 m were identified and analyzed. A mechanical concept was selected that can accommodate a set class of scientific instruments such as the LAMAR X-ray experiment with 24 LAMAR telescopes.
N.W.

N82-21246*# Boeing Co., Seattle, Wash.
APPLICATION OF MULTI-FUNCTION DISPLAY AND CONTROL TECHNOLOGY Progress Report
R. J. Spiger, R. J. Farrell, and G. A. Holcomb [1982] 71 p refs
(Contract NAS9-16445)
(NASA-CR-167583; NAS 1.26:167583; D180-26988-1) Avail: NTIS HC A04/MF A01 CSCL 22B

The NASA orbiter spacecraft incorporates a complex array of systems, displays, and controls. The incorporation of discrete dedicated controls into a multifunction display and control system (MFDCS) offers the potential for savings in weight, power, panel space, and crew training time. Technology identified as applicable to a MFDCS is applied to the orbiter orbital maneuvering system (OMS) and the electrical power distribution and control system (EPDCS) to derive concepts for a MFDCS design. Several concepts of varying degrees of performance and complexity are discussed and a suggested concept for further development is presented in greater detail. Both the hardware and software aspects and the human factors considerations of the designs are included.
J.M.S.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

N82-21247# Rolls-Royce Ltd., Derby (England).
TELEMETRY IN AERO ENGINE DEVELOPMENT
A. E. Hubble 1980 19 p
(PNR-90055) Avail: NTIS HC A02/MF A01

The use of an Acurex telemetry system for obtaining in situ strain and temperature measurements of a high pressure compressor rotor disk is described. The transmitter is mounted inside the compressor shaft with an auxiliary supply of cooling air. Calibration techniques of the strain gages, transmitter and receivers are given. Procedures used for selective test bed transmitter frequencies are listed. Laboratory test results for the thermocouple and static strain transmitters show good agreement with manufacturers' data. A comparison with similar battery operated equipment is made.
Author (ESA)

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N82-21248*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.

AEROTHERMODYNAMIC ENVIRONMENT OF A TITAN AEROCAPTURE VEHICLE Final Report, 4 Nov. 1980 - 3 Nov. 1981

S. N. Tiwari and H. Chow Jan. 1982 151 p refs

(Grant NAG1-120)

(NASA-CR-168721; NAS 1.26:168721) Avail: NTIS HC A08/MF A01 CSCL 22B

The extent of convective and radiative heating for a Titan aerocapture vehicle is investigated. The flow in the shock layer is assumed to be axisymmetric, steady, viscous, and compressible. It is further assumed that the gas is in chemical and local thermodynamic equilibrium and tangent slab approximation is used for the radiative transport. The effect of the slip boundary conditions on the body surface and at the shock wave are included in the analysis of high-altitude entry conditions. The implicit finite difference techniques is used to solve the viscous shock-layer equations for a 45 degree sphere cone at zero angle of attack. Different compositions for the Titan atmosphere are assumed, and results are obtained for the entry conditions specified by the Jet Propulsion Laboratory. Author

N82-21249# European Space Agency, Paris (France).

SPACECRAFT DYNAMIC ANALYSIS USING CANTILEVER MODES OF THE APPENDAGES: AN APPLICATION TO THE SPACE TELESCOPE

D. Poelaert (ESTEC, Noordwijk, Netherlands) Oct. 1981 103 p refs

(ESA-STR-206; ISSN-0379-4067) Avail: NTIS HC A06/MF A01; ESA, Paris FF 55

Spacecraft global modes are studied when the fixed base modes of the flexible appendages obtained first are equivalent to solving an implicit eigenvalue problem for a system of up to six dimensions (the number of spacecraft rigid modes). The key for performing the global dynamical analysis without having to reconsider the whole structural modeling of the appendages (by the finite element or other methods) is provided. This is useful when appendages are added, modified, or assume different orientations with respect to the spacecraft, e.g., solar arrays before and after a slew maneuver. The method produces transfer functions between forces and displacements at any two points of the spacecraft, including the flexible parts. Selection of the significant modes is based on the importance of their modal gains rather than on frequency bandwidth considerations; the errors introduced by such a modal truncation are interpreted. Author (ESA)

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

N82-21250*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

AVIONICS TEST BED DEVELOPMENT PLAN

L. H. Harris, J. Mac Parks, and C. R. Murdock Dec. 1981 89 p

(Contract NAS9-15800)

(NASA-CR-167579; JSC-17859; NAS 1.26:167579; LEMSCO-17155A) Avail: NTIS HC A05/MF A01 CSCL 22B

A development plan for a proposed avionics test bed facility for the early investigation and evaluation of new concepts for the control of large space structures, orbiter attached flex body experiments, and orbiter enhancements is presented. A distributed data processing facility that utilizes the current laboratory resources for the test bed development is outlined. Future studies required for implementation, the management system for project control, and the baseline system configuration are defined. A background analysis of the specific hardware system for the preliminary baseline avionics test bed system is included. E.A.K.

N82-21251*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex. Engineering Development and Integration Branch.

AVIONICS TEST BED DEVELOPMENT PLAN

L. H. Harris, J. Mac Parks, and C. R. Murdock Dec. 1981 37 p

(Contract NAS9-15800)

(NASA-CR-167580; JSC-17859; NAS 1.26:167580; LEMSCO-17155A-Suppl) Avail: NTIS HC A03/MF A01 CSCL 22B

The plan is for a facility for the early investigation and evaluation of new concepts for the control of large space structures, orbiter attached flex body experiments, and orbiter enhancements. This plan outlines a distributed data processing facility that will utilize the current JSC laboratory resources for the test bed development. The future studies required for implementation, the management system for project control, and the baseline system configuration are described. T.M.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N82-21252*# Xerox Electro-Optical Systems, Pasadena, Calif.

INERT GAS ION THRUSTER Final Report, Mar. 1978 - Dec. 1980

William D. Ramsey Dec. 1980 90 p refs

(Contract NAS3-21345)

(NASA-CR-165521; NAS 1.26:165521; Rept-2372-5009) Avail: NTIS HC A05/MF A01 CSCL 21C

Inert gas performance with three types of 12 cm diameter magnetoelectrostatic containment (MESC) ion thrusters was tested. The types tested included: (1) a hemispherical shaped discharge chamber with platinum cobalt magnets; (2) three different lengths of the hemispherical chambers with samarium cobalt magnets; and (3) three lengths of the conical shaped chambers with aluminum nickel cobalt magnets. The best argon performance was produced by a 8.0 cm long conical chamber with alnico magnets. The best xenon high mass utilization performance was obtained with the same 8.0 cm long conical thruster. The hemispherical thruster obtained 75 to 87% mass utilization at 185 to 205 eV/ion of singly charged ion equivalent beam. E.A.K.

N82-21253*# O'Donnell and Associates, Inc., Pittsburgh, Pa.

DEVELOPMENT OF A SIMPLIFIED PROCEDURE FOR THRUST CHAMBER LIFE PREDICTION Final Report

J. S. Porowski, M. Badlani, B. Kasrale, W. J. O'Donnell, and D. Peterson Oct. 1981 85 p refs

(Contract NAS3-22649)

(NASA-CR-165585; NAS 1.26:165585; ODAI-1403-12-81) Avail: NTIS HC A05/MF A01 CSCL 21H

An analytical design procedure for predicting thrust chamber life considering cyclically induced thinning and bulging of the hot gas wall is developed. The hot gas wall, composed of ligaments connecting adjacent cooling channel ribs and separating the coolant flow from the combustion gas, is subjected to pressure loading and severe thermal cycling. Thermal transients during start up and shut down cause plastic straining through the ligaments. The primary bending stress superimposed on the alternate in-plane cyclic straining causes incremental bulging of

the ligaments during each firing cycle. This basic mechanism of plastic ratcheting is analyzed and a method developed for determining ligament deformation and strain. The method uses a yield surface for combined bending and membrane loading to determine the incremental permanent deflection and pregressive thinning near the center of the ligaments which cause the geometry of the ligaments to change as the incremental strains accumulate. Fatigue and tensile instability are affected by these local geometry changes. Both are analyzed and a failure criterion developed.
Author

N82-21254*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE POWER SUBSYSTEM AUTOMATION TECHNOLOGY
James R. Graves, comp. Mar. 1982 219 p Proc. of a Conf./Workshop held at Marshall Space Flight Center, Ala., 28-29 Oct. 1981
(NASA-CP-2213; M-371; NAS 1.55:2213) Avail: NTIS HC A10/MF A01 CSCL 22B

The technology issues involved in power subsystem automation and the reasonable objectives to be sought in such a program were discussed. The complexities, uncertainties, and alternatives of power subsystem automation, along with the advantages from both an economic and a technological perspective were considered. Whereas most spacecraft power subsystems now use certain automated functions, the idea of complete autonomy for long periods of time is almost inconceivable. Thus, it seems prudent that the technology program for power subsystem automation be based upon a growth scenario which should provide a structured framework of deliberate steps to enable the evolution of space power subsystems from the current practice of limited autonomy to a greater use of automation with each step being justified on a cost/benefit basis. Each accomplishment should move toward the objectives of decreased requirement for ground control, increased system reliability through onboard management, and ultimately lower energy cost through longer life systems that require fewer resources to operate and maintain. This approach seems well-suited to the evolution of more sophisticated algorithms and eventually perhaps even the use of some sort of artificial intelligence. Multi-hundred kilowatt systems of the future will probably require an advanced level of autonomy if they are to be affordable and manageable. Author

N82-21255# Royal Aircraft Establishment, Farnborough (England).
LUMPED GEOPOTENTIAL HARMONICS OF ORDER 29, FROM ANALYSIS OF THE ORBIT OF COSMOS 837 ROCKET
H. Hiller Jun. 1981 17 p refs
(RAE-TR-81070; RAE-Space-597; BR79578) Avail: NTIS HC A02/MF A01

The orbit of the Cosmos 837 rocket (1976-62E) was determined at 36 epochs between Jan. and Sep. 1978, using the RAE orbit refinement program PROP6 with about 3000 observations. The inclination was 62.7 deg and the eccentricity 0.039. The orbital accuracy achieved was between 30 m and 150 m, both radial and crosstrack. The orbit was near 29:2 resonance in 1978 (exact resonance occurred on May 14) and the values of orbital inclination obtained were analyzed to derive lumped 29th-order geopotential harmonic coefficients, namely: 10E9C29E0.2 = -10+or-15 and 10E9S29E0.2 = -76+or-12. The values of lumped harmonics obtained from analysis of the values of eccentricity are not well defined, because of the high correlations between them and the errors in removing the very large perturbation (31 km) due to odd zonal harmonics.
Author (ESA)

N82-21256# Royal Aircraft Establishment, Farnborough (England). Space Dept.
THE CYCLIC LIFE TEST OF A T5 ION THRUSTER HOLLOW CATHODE TO 4200 HOURS
D. G. Fearn and G. L. Davis (Mullard Central Materials Lab., Mitcham, England) May 1981 43 p refs
(RAE-TR-81061; RAE-Space-596; BR80076) Avail: NTIS HC A03/MF A01

The performance of a hollow cathode under cyclic life test is reported. The steady state discharge conditions were representative of those found in thruster operation, but the thermal stresses imposed during discharge initiation are much more severe than normal. The cathode behaved faultlessly for 4200 hours, which included 1343 cycles. An evaluation of the amount of barium remaining in its dispenser suggests that a much longer lifetime, perhaps 15000 hours, should be feasible. The design is thus suitable for all envisaged north south stationkeeping missions of geostationary spacecraft. Author (ESA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N82-21257# Materials Research Labs., Melbourne (Australia).
THE 1-METHYL-5-NITROTETRAZOLE AND 2-METHYL-5-NITROTETRAZOLE: PART 1. SYNTHESIS, CHARACTERIZATION AND DETECTION AND MOLECULAR COMPLEX
Robert J. Spear Jun. 1980 20 p refs
(MRL-R-780-Pt-1; AR-002-165-Pt-1) Avail: NTIS HC A02/MF A01

The preparation of two novel castable primary explosives, 1-methyl-5-nitrotetrazole and 2-methyl-5-nitrotetrazole, is described. Both were prepared from tetrazol-5-amine monohydrate. Their synthesis including methylation, separation and diazotization are described. Some initial data relating to the nature of the complexes formed are described. Both nitrotetrazoles were characterized spectroscopically and chromatographically, and methods for their qualitative and quantitative detection are described. M.D.K.

24 COMPOSITE MATERIALS

Includes laminates.

N82-21258*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STRENGTH ADVANTAGES OF CHEMICALLY POLISHED BORON FIBERS BEFORE AND AFTER REACTION WITH ALUMINUM
James A. DiCarlo and Robert J. Smith 1982 28 p refs Presented at the 6th Ann. Conf. on Composites and Advanced Mater., Cocoa Beach, Fla., 18-21 Jan. 1982; sponsored by the American Ceramic Society
(NASA-TM-82806; E-1146; NAS 1.15:82806) Avail: NTIS HC A03/MF A01 CSCL 11D

In order to determine their strength potential, the fracture properties of different types of commercial boron fibers were measured before and after application of secondary strengthening treatments. The principal treatments employed were a slight chemical polish, which removed low strength surface flaws, and a heat treatment in oxygen, which contracted the fibers and thereby compressed intrinsic bulk flaws. Those fiber types most significantly strengthened were 200 to 400 micrometers (8 to 16 mil) diameter boron on tungsten fibers produced in a single chemical vapor deposition reactor. The slight polish increased average tensile strenghts from 3.4 to 4.4 CN/m2GN/sq m (500 to 640 ksi) and reduced coefficients of variation from about 15 to 3 percent. The oxygen heat treatment plus slight polish further improved average strengths to 5.5 GN/m2 GN/sq m (800 ksi) with coefficients near 3 percent. To ascertain whether these excellent properties could be retained after fabrication of B/Al composites, as produced and polished 203 micrometers (8 mil) fibers were thinly coated with aluminum, heat treated at B/Al fabrication temperatures, and then tested in tension and flexure at room temperature. The pre-polished fibers were observed to retain their superior strengths to higher temperatures than the as-produced fibers even though both were subjected to the same detrimental reaction with aluminum. Author

N82-21259*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TUNGSTEN FIBER REINFORCED SUPERALLOY COMPOSITE HIGH TEMPFRATURE COMPONENT DESIGN CONSIDERATIONS

Edward A. Winsa 1982 23 p refs Presented at the 111th Ann. Meeting of the Am. Inst. of Mining, Met. and Petrol. Engr., Dallas, 14-18 Feb. 1982

(NASA-TM-82811; E-1152; NAS 1.15:82811) Avail: NTIS HC A02/MF A01 CSCL 11D

Tungsten fiber reinforced superalloy composites (TFRS) are intended for use in high temperature turbine components. Current turbine component design methodology is based on applying the experience, sometimes semiempirical, gained from over 30 years of superalloy component design. Current composite component design capability is generally limited to the methodology for low temperature resin matrix composites. Often the tendency is to treat TFRS as just another superalloy or low temperature composite. However, TFRS behavior is significantly different than that of superalloys, and the high environment adds consideration not common in low temperature composite component design. The methodology used for preliminary design of TFRS components are described. Considerations unique to TFRS are emphasized. Author

N82-21260*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THERMAL DEGRADATION OF THE TENSILE PROPERTIES OF UNDIRECTIONALLY REINFORCED FP-Al203/EZ 33 MAGNESIUM COMPOSITES

R. T. Bhatt (AVRADCOM) and H. H. Grimes 1982 9 p refs Presented at the 111th Ann. Meeting of the Am. Inst. of Mining, Met. and Petro. Engr., Dallas, 14-18 Feb. 1982

(NASA-TM-82817; E-1164; NAS 1.15:82817; AVRADCOM-TR-82-C-2) Avail: NTIS HC A02/MF A01 CSCL 11D

The effects of isothermal and cyclic exposure on the room temperature axial and transverse tensile strength and dynamic flexural modulus of 35 volume percent and 55 volume percent FP-Al2O3/EZ 33 magnesium composites were studied. The composite specimens were continuously heated in a sand bath maintained at 350 C for up to 150 hours or thermally cycled between 50 and 250 C or 50 and 350 C for up to 3000 cycles. Each thermal cycle lasted for a total of six minutes with a hold time of two minutes at the maximum temperature. Results indicate to significant loss in the room temperature axial tensile strength and dynamic flexural modulus of composites thermally cycled between 50 and 250 C or of composites isothermally heated at 350 C for up to 150 hours from the strength and modulus data for the untreated, as fabricated composites. In contrast, thermal cycling between 50 and 350 C caused considerable loss in both room temperature strength and modulus. Fractographic analysis and measurement of composite transverse strength and matrix hardness of thermally cycled and isothermally heated composites indicated matrix softening and fiber/matrix debonding due to void growth at the interface and matrix cracking as the likely causes of the strength and modulus loss behavior. S.L.

N82-21261# Hughes Aircraft Co., Culver City, Calif.

ADVANCED CONCEPTS FOR COMPOSITE STRUCTURE JOINTS AND ATTACHMENT FITTINGS. VOLUME 1: DESIGN AND EVALUATION Final Report, Jul. 1977 - Dec. 1980

J. V. Alexander and R. H. Messinger Nov. 1981 127 p refs 2 Vol.

(Contract DAAJ02-77-C-0076; DA Proj. 1L2-62209-AH-76) (AD-A110212; HH-80-402-Vol-1; USAAVRADCOM-TR-81-D-21A) Avail: NTIS HC A07/MF A01 CSCL 01/3

The purpose of this program was to develop the technology of applying fiber-reinforced composite materials to helicopter joints and attachment fittings that permit disassembly of major components. A generic design methodology approach was used to make the data developed applicable to ongoing and future helicopter programs. A detail design, analysis, and testing program was carried out on the three joint and fitting concepts selected: wrapped tension fittings, gearbox attachment fittings, and seat attachment fittings. The scope of the study included analytical design tools, including finite element computer analysis; fabrication techniques, with special emphasis on weight and cost effectiveness considerations; structural integrity testing, including static, dynamic, failsafe/safe-life, and ballistic tolerance considerations; and nondestructive inspection (NDI) techniques. Author (GRA)

N82-21262# Swedish Cement and Concrete Research Inst., Stockholm.

ASPECTS ON TESTING METHODS FOR ACID ATTACKS ON CONCRETE: FURTHER EXPERIMENTS

Lars Romben 1980 98 p refs

(CBI-F-9-79; ISSN-0346-6906) Avail: NTIS (US sales Only) HC A05/MF A01; DOE Depository Libraries

A number of control experiments which were performed to verify test procedures of the resistance of concrete and concrete products is presented. A more detailed study of the calcium dissolution and the layer dissolution process was performed. The mechanisms which control the rate of attack in the long term are discussed. The proposed method is intended for use in studying the resistance to attack by acid water solutions. DOE

N82-21263# National Physical Lab., Teddington (England). Div. of Chemical Standards.

AN APPRAISAL OF THE RESISTANCE OF REFEL SILICON CARBIDE TO CHEMICAL ATTACK

D. J. Clinton, L. A. Lay, and R. Morrell Jul. 1980 19 p refs (NPL-Chem-113; ISSN-0143-7003) Avail: NTIS HC A02/MF A01

Short period chemical attack experiments with weight loss determinations were conducted on REFEL silicon carbide samples. Tests were of the crucible type, open to the air, except in the cases of molten metal attack in which a flushed argon atmosphere was used. Microstructural studies were used to determine depth of penetration. Results show that the material is relatively resistant to water and acids, except HF/HNO3 mixtures, but is fairly easily leached by alkaline solutions. Attack by a variety of fused salts is rapid, as is also the case for some fused oxides (PbO, V2O5, Na VO3) in an oxidizing atmosphere. Molten lead and tin do not degrade the material, but sodium at 500 C, lithium at 400 C and aluminum at 800 C all react extensively. Solid platinum reacts with the silicon phase at 1100 C to form a Si/Pt alloy with a low melting temperature. Author (ESA)

N82-21264# National Engineering Lab., East Kilbride (Scotland) Forming and Fabrication Div.

COMPUTER PROCEDURES AND EXPERIMENTAL STUDY OF FIBER REINFORCED COMPOSITES

G. D. Scowen Aug. 1980 72 p refs

(NEL-668) Avail: NTIS HC A04/MF A01

Procedures for the design analysis of multilayered composites are described. Some composite properties are derived using a computer program. Data files of fiber matrix properties are included. Extension of the program to an interactive graphics design is discussed. Experimental data on the elastic properties of composite laminates are correlated with a theory that considers void and interply layer effects. Thermal and gage length effects on strain measurement by electrical gages were examined and found to lead to erroneous values of modulus. The elastic characteristics of composites predicted from the design program correlate reasonably well with experimental values for laminates. Author (ESA)

N82-21265# Defence Research Information Centre, Orpington (England).

CARBON MATERIALS

S. Kimura and M. Inagaki Jan. 1981 22 p refs Transl. into ENGLISH from Seramikkusu, v. 14, no. 11, 1979 p 977-985 (DRIC-T-6220; BR77462) Avail: NTIS HC A02/MF A02

Forms of carbon ranging form porous to dense substances, which are either isotropic or anisotropic, were studied both microscopically and macroscopically. An international standardization of physical measurement and indexation is necessary because of the extensive use of such materials. Polarized light microscopy, X-ray diffraction methods and Raman spectroscopy are discussed. The magnetic resistance and the strengths and fracture brittleness properties give structural information. In general, the strength of carbon materials is related to micro-scale features and compactness (bulk density, size and distribution of pores). Author (ESA)

N82-21266# Rolls-Royce Ltd., Derby (England).
APPLICATIONS AND PROPERTIES OF SINTERED ZIRCONIUM OXIDE. PART 1: MECHANICAL AND THERMAL PROPERTIES
Hans H. Sturhahn, Walter Dawihl, and Gerhard Thamerus 1981 17 p refs Transl. into ENGLISH of Ber. Dt. Keram. Ges. (W. Germany), v. 52, no. 3, 1975 p 59-62
(PNR-90060; Trans-15447; TLT-00812) Avail: NTIS HC A02/MF A01

Close packed zirconium oxide materials having a residual porosity below 1.5% are described. Addition of stabilizers brings the proportion of cubic phase present at room temperature to 85% to 90%. The materials are characterized by unusually good wear resistance and mechanical strength which are not readily achieved by polycrystalline oxide materials. In comparison with pure aluminum oxide, the thermal conductivity is poorer by about one order of magnitude. The specific heat is lower and the linear thermal extension slightly higher. Author (ESA)

N82-21267# Royal Aircraft Establishment, Farnborough (England). Materials Dept.
A BASIC COMPUTER PROGRAM TO CALCULATE MOISTURE CONTENT IN RESINS AND FIBRE REINFORCED RESIN COMPOSITES
P. T. Curtis Jun. 1981 20 p refs
(RAE-TM-MAT-375; BR79976) Avail: NTIS HC A02/MF A01

A computer program which calculates the moisture absorption of epoxy resin and fiber composite sheets from the sheet thickness, the diffusivity, and the relative humidity of the environment, is presented. One dimensional Fickian diffusion is assumed in the calculations. The distribution of water through the laminate thickness is calculated and displayed graphically. The program can be used for any resin of fiber composite in which the primary moisture diffusion mechanism is bulk diffusion through the resin. Examples for typical fiber reinforced epoxy composite laminates are given and the implications are discussed. Diffusion data for three materials at room temperature and two materials at 50C are listed for use in the program. Author (ESA)

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N82-21268* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
METHOD OF MAKING FORMULATED PLASTIC SEPARATORS FOR SOLUBLE ELECTRODE CELLS Patent
Dean W. Sheibley, inventor (to NASA) Issued 5 Jan. 1982 7 p Filed 3 Nov. 1977 Supersedes N78-25149 (16 - 16, p 2085) Continuation of US Patent Appl. SN-776146, US Patent-4,133,941, filed 10 Mar. 1977
(NASA-Case-LEW-12358-2; US-Patent-4,309,372;
US-Patent-Appl-SN-848428; US-Patent-4,133,941;
US-Patent-Appl-SN-776146; US-Patent-Class-264-453;
US-Patent-Class-264-53; US-Patent-Class-264-216;
US-Patent-Class-427-115; US-Patent-Class-427-244;
US-Patent-Class-427-246) Avail: US Patent and Trademark Office CSCL 07D

A method making a membrane comprised of a hydrochloric acid-insoluble sheet of a mixture of a rubber and a powdered ion transport material is disclosed. The sheet can be present as a coating upon a flexible and porous substrate. These membranes can be used in oxidation-reduction electrical accumulator cells wherein the reduction of one member of a couple is accompained by the oxidation of the other member of the couple on the other side of the cell and this must be accompained by a change in chloride ion concentration in both sides. The method comprises preparing a mixture of fine rubber particles, a solvent for the rubber and a powdered ion transport material. The mixture is formed into a sheet and dried to produce a microporous sheet. The ion transport material includes particles ranging from about 0.01 to 10 microns in size and comprises from 20 to 50 volume percent of the microporous sheet.
Official Gazette of the U.S. Patent and Trademark Office

N82-21269* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AIR REMOVAL DEVICE Patent
Franklin W. Booth and Robert A. Bruce Issued 24 Nov. 1981 4 p Filed 27 Feb. 1976 Supersedes N76-23522 (14 - 14, p 1795) Continuation of abandoned US Patent Appl. SN-810576, filed 26 Mar. 1969
(NASA-Case-XLA-8914-2; US-Patent-4,302,223;
US-Patent-Appl-SN-662181; US-Patent-Appl-SN-810576;
US-Patent-Class-55-158; US-Patent-Class-210-321.1) Avail: US Patent and Trademark Office CSCL 07D

The disclosure concerns a device suitable for removing air from water under both zero and one 'g' gravity conditions. The device is comprised of a pair of spaced membranes on being hydrophobic and the other being hydrophilic. The air-water mixture is introduced into the space therebetween, and the selective action of the membranes yields removal of the air from the water. Official Gazette of the U.S. Patent and Trademark Office

N82-21270# Materials Research Labs., Melbourne (Australia).
AN EXAMINATION BY GAS CHROMATOGRAPHY-MASS SPECTROMETRY OF THE HYDROCARBONS PRESENT IN THE ALGA BOTRYOCOCCUS BRAUNII
M. N. Galbraith, L. W. Hillen, and L. V. Wake Nov. 1981 43 p refs
(MRL-R-836) Avail: NTIS HC A03/MF A01

The hydrocarbons present in a number of 'blooms' of Botryococcus braunii from different Australian sites were examined by gas chromatography-mass spectrometry. This organism was found to contain many novel branched-chain hydrocarbons of the type Cn-H2n-10 where n equals 30, 34, 35, 36 or 37. These compounds were present in both red and green 'blooms' of the alga. R.J.F.

N82-21271# Council for Scientific and Industrial Research, Pretoria (South Africa).
THE USE OF ATACTIC POLYPROPYLENE AS A COMPONENT FOR INCREASING THE PLASTICITY OF BITUMEN
A. Bukowski and K. Piotrowska 1981 8 p Transl. into ENGLISH from Plaste und Kautschuk (East Germany), v. 27, no. 4, 1980 p 215-216
(CSIR-Trans-1582) Avail: NTIS HC A02/MF A01

Asphalts with a greater plasticity compared to pure bitumen, and therefore with a greater resistance to heat, can be produced by modifying bitumen with atactic polypropylene. The heat resistance of the modified bitumen (the difference between fusing temperature and breaking point) increases as the polymer fraction of the mixture increases. The polypropylene decreases the hardness and penetration of the bitumen and therefore the utilization of these products for road construction is rather limited. Standardized methods which are usually applied to pure bitumens are employed to test the properties of bitumen polypropylene mixtures. The Kargin method for the determination of thermodynamic curves is used to determine the deformation behavior of bitumen modified with atactic polypropylene although only the mixtures containing the higher oxidized bitumens can be characterized specifically.
S.L.

N82-21272# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.
PHOTOCHEMISTRY OF SURFACE-CONFINED MONONUCLEAR AND TRINUCLEAR RUTHENIUM CARBONYL COMPLEXES. DIRECT EVIDENCE FOR THE ABILITY TO ISOLATE PHOTOGENERATED INTERMEDIATES FROM EACH OTHER ON HIGH SURFACE AREA SILICA
David K. Liu and Mark S. Wrighton 4 Jan. 1982 22 p refs (Contract N00014-75-C-0880)
(AD-A110082; TR-31) Avail: NTIS HC A02/MF A01 CSCL 07/5

Photoactivation of homogeneous organometallic catalysts by light-induced extrusion of 2-electron donor ligands or metal-metal bond cleavage has been demonstrated. A problem that has arisen

is that the reactive solution species can recombine with the extruded ligand or can react with each other to form inactive clusters. We now report the synthesis and photochemical behavior of LRu(CO)4 and L3Ru3(CO)9 confined to the surface of high surface area silica. The results illustrate that immobilization of precursors to coordinatively unsaturated species prevents cluster formation, when the surface coverage is sufficiently low. Further, photodeclusterification of anchored L3Ru3(CO)9 is reversible due to the immobilization of the fragments. GRA

N82-21273# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ELECTROCHEMICAL STUDIES OF BENZOPHENONE AND FLUORENONE IMINES, AMINES AND DIPHENYLDIAZOMETHANE M.S. Thesis - Kansas State Univ.
James H. Barnes, Jr. 1982 65 p refs
(AD-A110435; AFIT/NR-82-1T) Avail: NTIS HC A04/MF A01 CSCL 07/4

The redox behavior of several nitrogen containing derivatives of fluorenone and benzophenone was studied. In this continuation of the study of possible precursors to carbene anoin radicals, diphenyldiazomethane (Ph2CN2) was studied in acetonitrile (AN) containing Me4NPF6 (saturated) as the supporting electrolyte. This was done to conform that the lifetime of the anoin radical (Ph2CN2) is less than 1 ms in this electrolyte system. Parker and Bethell have recently reported that electroreduction of Ph2CN2 in AN-Me4NPF6 (saturated) at a hanging mercury drop electrode is electrochemically reversible at T = 8 C and v = 100 V/s. We have shown that their interpretation is in error, and that it is an artifact of unrecognized adsorption effects on the mercury electrode. The results reported here are consistent with previous findings using platinum as the cathode, i.e., the Ph2CN2 initially formed undergoes rapid loss of molecular nitrogen (t (to the 1/2) < or = 1 ms) to yield the carbene anoin radical. GRA

N82-21274# Ballistic Research Labs., Aberdeen Proving Ground, Md. . Ballistic Research Lab.
EFFECT OF BLACK POWDER COMBUSTION ON HIGH AND LOW-PRESSURE IGNITER SYSTEMS Memorandum Report, Jan. 1978 - Sep. 1979
Kevin J. White, Hughes E. Holmes, and John R. Kelso Nov. 1981 51 p refs
(DA Proj. 1L1-62618-AH-80)
(AD-A110017; ARBRL-MR-03150) Avail: NTIS HC A03/MF A01 CSCL 19/1

Large-caliber igniter systems have been evaluated using black powder lots which were manufactured with specific defects. The purpose of the program was to determine how the igniter system performance was affected by the black powder. At the same time, several conventional 'ots from two different black powder manufacturing companies were also tested in the igniters. Igniter action time was found to vary considerably depending on the lot used. Various other tests, including high-speed cinematography, have shown that the igniter performance differences are related to combustion characteristics of black powder which vary from lot to lot. Slow-burning lots form large amounts of liquid droplets at the surface which then move into the flame above the surface. Fast lots burn with very little droplet formation. Particle size and the degree of mixing of the ingredients appear to be related to the combustion properties. However, more factors are involved and are currently under study. Examination of low-pressure igniter performance indicates that there are slow and rapid gas generation rates. The transition from the slow to the rapid rate takes place at low pressure. Author (GRA)

N82-21275# National Bureau of Standards, Washington, D.C.
PASSIVE FILMS, SURFACE STRUCTURE AND STRESS CORROSION SUSCEPTIBILITY Annual Report, Aug. 1980 - Aug. 1981
J. Kruger, J. J. Ritter, J. J. Carroll, and A. J. Melmed Aug. 1981 68 p refs
(AD-A110179; NBSIR-81-2396(ONR)) Avail: NTIS HC A04/MF A01 CSCL 07/4

Transparent organic coatings on iron are used to simulate painted metal surfaces for simultaneous ellipsometric and electrochemical measurements. These studies show that significant changes occur both in the metal oxide film and in the sub-coating environment during prolonged immersion in dilute Cl(-) media. The relationship of these changes to phenomena such as metal passivation, coating delamination, and inhibitor behavior are addressed. GRA

N82-21276# Washington Univ., Seattle. Lab. for Chemometrics.
COMPENSATION FOR DRIFT AND INTERFERENCES IN MULTICOMPONENT ANALYSIS Interim Report
J. H. Kalivas and B. R. Kowalski Jan. 1982 35 p refs
(Contract N00014-75-C-0526; NR Proj. 051-565)
(AD-A110114; TR-21) Avail: NTIS HC A03/MF A01 CSCL 07/4

The detection and subsequent correction of drift in an analytical signal occurring during the course of an analysis is a common problem in analytical chemistry. In this paper, a solution to this problem is presented in the form of an extension to the theory of the Generalized Standard Addition Method (GSAM), a method currently used to simultaneously correct for matrix effects and interferences in multicomponent analysis. Author (GRA)

N82-21277# Oak Ridge Y-12 Plant, Tenn. Nuclear Div.
EQUILIBRIUM-PRESSURE ISOTHERMS FOR THE SYSTEM LITHIUM-LITHIUM HYDRIDE-HYDROGEN AT 823, 873, AND 9230 K
R. F. Simandl Oct. 1981 24 p refs
(Contract W-7405-eng-26)
(DE82-001626; Y-2242) Avail: NTIS HC A02/MF A01

Full equilibrium pressure isotherms for the system lithium-lithium hydride-hydrogen at 823, 873, and 9230 K were determined. Expressions for the solubility of hydrogen in liquid lithium at these three temperatures were derived. The stoichiometry of the lithium hydride present as hydrogen-to-lithium atom ratios approached unity was determined. DOE

N82-21278# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France).
OXIDATION OF STAINLESS STEELS IN WATER VAPOR-OXYGEN MIXTURES. DESIGN AND DEVELOPMENT OF AN ORIGINAL EQUIPMENT Ph.D. Thesis Universitie Pierre et Marie Curie, 27 Mar. 1980
Leonardo Uller Feb. 1981 163 p refs In FRENCH; ENGLISH summary
(CEA-R-5078) Avail: NTIS (US Sales Only) HC A08/MF A01; DOE Depository Libraries

A device including a thermobalance placed in a tight housing was conceived and built. This apparatus is suitable to submit metallic samples to the action of dry oxygen, deoxygenated water vapor or mixtures of water vapor and oxygen. The first results obtained with this device, at 6000 C, and for a 18-10 stainless steel are: - in the presence of deoxygenated water vapor, one observes very fast oxidation kinetics, with a roughly parabolic law (K approximately equal to 3x10(+2) mg(2).cm(+4).h(+1)); - the addition of oxygen from about 10 vpm onwards, induces an important initial slowing down of the kinetics; - the duration of this 'induction' period rises with increasing the oxygen content of the water vapor, but the protection of the alloy due to the action of oxygen remains temporary; - in another way, experiments begun with water vapor, were continued with pure oxygen, and reciprocally. During these 'mixed' experiments, the weight increases were continually recorded. A swift slowing down has been observed in the first case and an important acceleration in the second one. DOE

N82-21279# Otisca Industries Ltd., Syracuse, N.Y.
HEAVY-LIQUID BENEFICIATION OF FINE COAL Quarterly Report, 1 Apr. - 30 Jun. 1981
D. V. Keller, Jr. and Frederick J. Simmons Jul. 1981 37 p refs
(Contract DE-AC22-80PC-30139)
(DE81-030965; DOE/PC-30139/T2; QR-3) Avail: NTIS HC A03/MF A01

This reporting period was devoted to the development of the rheological data for the coal/Freon-113 particle size, density, and percent solids matrix. Preliminary rheological data have also been obtained for the coal-water-magnetite slurry system. The evaluation of this system will continue into the Fourth Quarter. Sufficient rheological data were obtained so that the design criteria

for the bench scale cyclone test facility was developed. The design effect for bench scale cyclone test facility was completed and a preliminary design proposal submitted to DOE on July 21, 1981. DOE

N82-21280# Solar Turbines International, San Diego, Calif.
MECHANISMS OF FOULING, SLAGGING, AND CORROSION BY PULVERIZED-COAL COMBUSTION Quarterly Technical Progress Report, 1 Jul. - 30 Sep. 1981
L. L. Hsu, A. R. Stetson, and A. G. Metcalfe Oct. 1981 40 p ref
(Contract DE-AC22-81PC-40272)
(DE82-001661; DOE/PC-40272/T2; SR-81-R-4930-08; QTPR-2) Avail: NTIS HC A03/MF A01

The objective of this program is to conduct a detailed and comprehensive study of the mechanisms of fouling slagging, and corrosion in pulverized coal combustion by employing well controlled model systems which simulate the coal combustion environment. In the second quarter, work focused on completing construction of the test rig. Meanwhile, the combustor and fuel nozzle were redesigned to allow for introduction of particulates and salt solution through the fuel nozzle. Fabrication of the modified combustor and fuel nozzle is complete. The completed test system will allow particles and salt droplets to flow through the combustion zone prior to impingement on the specimen tubes. Construction of specimen retort for furnace testing is complete. Plans for the next quarter are to install and calibrate the combustor rig. DOE

N82-21281# Virginia Commonwealth Univ., Richmond. Dept. of Chemistry.
NEW CATALYSTS FOR THE INDIRECT LIQUEFACTION OF COAL Annual Technical Report, 1 Aug. 1980 - 31 Jul. 1981
G. A. Melson 1981 10 p
(Contract DE-FG22-80PC-30228)
(DE82-000892; DOE/PC-30228/T2) Avail: NTIS HC A02/MF A01

The synthesis, characterization and evaluation of catalytic activity for synthesis gas conversion of some supported metal catalysts were achieved during the period of grant support. These catalysts are significantly different from those obtained by conventional synthetic procedure and results in different product distributions when used for synthesis gas conversion. DOE

N82-21282# Energy and Environmental Research Corp., Santa Ana, Calif.
SOOT FORMATION IN SYNTHETIC-FUEL DROPLETS Quarterly Technical Progress Report, 1 Jul. - 30 Sep. 1981
G. England, J. Kramlich, Y. Kwan, and R. Payne 30 Nov. 1981 32 p refs
(Contract DE-AC22-80PC-30298)
(DE82-004257; DOE/PC-30298/T4; QTPR-4) Avail: NTIS HC A03/MF A01

The droplet effects on particulates, smoke, and NO sub x emissions using the variable spray momentum injector under normal excess air and staged combustion conditions was investigated. A total of four fuels were tested, including an SRC-II blend with middle and heavy distillate. Test results indicated that within the range of droplet sizes and injection velocities investigated, particulate emissions are not strongly dependent upon droplet parameters. The greatest effect was observed for relatively large droplets (500 microns) in regions of low slip velocity. The flame studies research was concentrated upon the completion of the droplet experiments. Microexplosions of individual droplets, oil-coke cenosphere formation for residual fuel oil, and violet secondary atomization of droplets blended from heptane and heavy synthetic fuel oil were observed. At fuel rich conditions, droplet soot was correlated with carbon/hydrogen ratio for a number of fuels. The coupling between the thermal and chemical processes within the soot formation region, the morphology of the soot, and visualization of individual droplet combustion were also studied. DOE

N82-21283# Weber State Coll., Ogden, Utah. Dept. of Chemistry.
ROLE OF THE HYDROGEN DONOR SOLVENT IN COAL HYDROLIQUEFACTION Progress Report, 1 Dec. 1980 - 28 Feb. 1982
R. R. Beishline 15 Oct. 1981 15 p refs
(Contract DE-AC02-79ER-10510)
(DE82-002716; DOE/ER-10510/T3) Avail: NTIS HC A02/MF A01

A free radical mechanism has been written for the thermolysis of the donor solvent intermediate 1,2-dihydronaphthalene (1,2-DHN). The initiation step (E/sub a/ about 38 kcal/mole) is a disproportionation between two molecules of 1,2-DHN to produce hydronaphthyl and tetralyl radicals. These radicals attack 1,2-DHN to produce dimers, or form naphthalene, tetralin and H., principally by disproportionation. The previously unknown structures of the dimers have been determined and are consistent with the proposed mechanism. The mechanism is also consistent with the experimentally measured kinetics, i.e., disappearance of 1,2-DHN by concurrent first and second order reactions. The observed first and second order rate constants are complex composites of the rate constants for the individual steps in the mechanism. Semiquantitative measurements show that molecular hydrogen is about 10% of the reaction product at 4500 C. When polycyclic aromatic hydrocarbons (PAH) are heated with 1,2-DHN, the amount of hydrogen evolved is approximately inversely proportional to the resonance energy of the PAH, i.e., the H addition: abstraction ratio increases with increasing stability of the potential hydroaromatic radical. A quantitative procedure for measuring hydrogen is being developed for future use in determining relative rates of H addition vs abstraction. DOE

N82-21284# Exxon Nuclear Idaho Co., Inc., Idaho Falls.
NEGATIVE THERMAL IONIZATION MASS SPECTROMETRY Annual Report
J. E. Delmore Sep. 1981 12 p refs
(Contract DE-AC07-79ID-01675)
(DE82-003035; ENICO-1098; AR-2) Avail: NTIS HC A02/MF A01

An investigation of negative thermal (surface) ionization as a means of generating ion beams from selected electronegative elements and molecules was made for the purpose of isotopic analysis. The operating characteristics of this type of ion source were determined. Major advances were made in the preparation of ionization surfaces for negative ion production. The role of electrons emitted by these surfaces and associated problems was clearly defined. A magnetron type ion source and lens was designed and will be constructed to overcome this problem for those elements that require high ionization temperatures. It was found that under special circumstances the scattering tail from negative ions was reduced by at least three orders of magnitude over the tailing from positive ions which facilitates the measurement of very wide ratios when using negative ions. M.D.K.

N82-21285# National Physical Lab., Teddington (England). Div. of Chemical Standards.
THE SURFACE ANALYSIS OF INSULATORS BY SIMS AND XPS: CHARGE NEUTRALISATION AND STABILISATION OF THE SURFACE POTENTIAL
C. P. Hunt, M. T. Anthony, C. T. H. Stoddart, and M. P. Seah Mar. 1980 26 p refs
(NPL-Chem-108; ISSN-0143-7003) Avail: NTIS HC A03/MF A01

Meaningful analysis requires stabilization of the surface potential to a defined reference point, i.e., the potential that would exist if the insulator were a conductor. In SIMS spectra, both the absolute and relative intensities of peaks depend on the surface potential while in XPS the peak positions and shapes are also dependent. It is shown that only by the correct design of an electron flood source can the surface be stabilized to a given constant reference potential. The relevant design principles are illustrated by measurements on isolated targets which define the characteristics of the flood source. In SIMS the surface can be stabilized to an accuracy of 1 eV and in XPS to + or - 0.02 eV about a chosen value. Author (ESA)

N82-21286# National Physical Lab., Teddington (England). Div. of Chemical Standards.
EQUATIONS FOR THE CORRELATION AND ESTIMATION OF VAPOUR PRESSURES
D. Ambrose Aug. 1980 45 p refs
(NPL-Chem-114; ISSN-0143-7003) Avail: NTIS

HC A03/MF A01

The general shape and characteristics of vapor pressure curves and some equations suitable for their representation are discussed. A method is described for the constrained fitting of vapor pressure equations; this ensures that the resultant curve has what is believed to be the correct shape. Schemes based on the principle of corresponding states, or the general parallelism of vapor pressures curves, i.e., the comparison method, are described. A growing need for vapor pressures at ambient temperatures of relatively involatile substances is noted; data are sparse and new values suitable for reference purposes with the comparison method are given together with the manner in which they were obtained. Simple methods for the correction of boiling points with change in atmospheric pressure are described. The paucity of good data for associated compounds and the lack of reliability of present estimation methods for these compounds are mentioned. The naming of some 19th century equations is also discussed. Author (ESA)

N82-21287# National Physical Lab., Teddington (England). Div. of Chemical Standards.

NEW EQUATIONS FOR THE REPRESENTATION OF VAPOUR-LIQUID EQUILIBRIA DATA FOR ISOTHERMAL BINARY MIXTURES

E. F. G. Herington Oct. 1980 26 p refs

(NPL-Chem-115; ISSN-0143-7003) Avail: NTIS HC A03/MF A01

A set of equations for the representation of binary isothermal vapor/liquid equilibria data is described. Members of the set can be designed to include as special cases equations in common use and the equations can contain as many constants as required. Equations of the form recommended can be fitted to experimental data by a least squares treatment and the resulting equations represent adequately most experimental data. Examples were studied and the results reported for systems with a single liquid phase, systems which nearly but not quite split into two liquid phases, and systems with two liquid phases. Water + ethanol, pyridine + water, 4-methylpyridine + water, and (two) 2,6-dimethlypyridine + water were examined. Author (ESA)

N82-21288# IEA Coal Research, London (England).

MATHEMATICAL MODELING OF FLUIDIZED BED COMBUSTORS

Jan Olofsson (Chalmers Univ. of Technology) Nov. 1980 100 p refs Sponsored by National Swedish Board for Energy Source Development, Spanga

(ICTIS/TR-14; ISBN-92-9029-060-9) Avail: NTIS HC A05/MF A01

The formulation of the mass and heat balances, and the discussion of a number of model elements describing various phenomena occurring in fluidized bed coal combustors (including fluid dynamics, combustion, flue gas emissions, and heat transfer to immersed surfaces) are discussed. Examples of existing models were reviewed, and based on this review, recommendations for future activities in the field of modeling are given. Author (ESA)

N82-21289# Environmental Protection Agency, Cincinnati, Ohio.

INORGANIC ANALYSES IN WATER QUALITY CONTROL PROGRAMS: TRAINING MANUAL

Audrey Kroner Jul. 1981 178 p

(PB82-108564; EPA-430/1-81-015) Avail: NTIS HC A09/MF A01 CSCL 07D

The analysis of selected inorganic pollutants is explained. Topics discussed are test procedures for acidity and alkalinity (titrations to pH end points), hardness (EDTA titration), chlorine (amperometric back titration), total phosphorus (persulfate digestion, ascorbic acid reduction, colorimetry), fluoride (SPADNS colorimetry and ion electrode), nitrate and nitrite (cadmium reduction, colorimetry), total and suspended solids (gravimetric), turbidity (nephelometer), and specific conductance (Wheatstone bridge conductivity meter). Other topics are sample handling; compliance methodology; accuracy, precision and error of data; elements of quality assurance programs. GRA

N82-21290# National Academy of Sciences - National Research Council, Washington, D. C.

PRUDENT PRACTICES FOR HANDLING HAZARDOUS CHEMICALS IN LABORATORIES

W. Spindel 1981 312 p refs

(Grant NSF PRM-79-16766)

(PB82-133364; NSF/PRM-81002; LC-80-26877) Avail: NTIS HC A14/MF A01 CSCL 07D

Safe practices in working with hazardous chemicals in laboratories are presented. Procedures for the handling and disposal of hazardous substances are outlined and the development of comprehensive laboratory programs are recommended. Procedures are presented for working with: (1) substances that pose hazards because of flammability or explosibility; (2) compressed gases; (3) pressures above or below atmospheric pressures; and (3) procurement, storage, distribution, and disposal of chemicals. Information is presented on known hazards of and specific precautions for a selected group of laboratory chemicals; protective apparel, safety equipment, emergency procedures, and first aid; design requirements for and use of electrically powered laboratory apparatus; and laboratory ventilation. GRA

N82-21291# National Bureau of Standards, Washington, D.C. Chemical Thermodynamics Div.

THERMODYNAMIC PROPERTIES OF SOLID ALKALI ALUMINOSILICATES AT ELEVATED TEMPERATURES Final Report

Richard H. Schumm Oct. 1981 52 p refs Sponsored in part by DOE

(PB82-131525; NBSIR-81-2343) Avail: NTIS HC A04/MF A01 CSCL 07D

Selected heat capacities, entropies, enthalpies, standard enthalpies of formation, standard energies of formation and the equilibrium formation constants for solid sodium aluminate, solid potassium aluminate and solid aluminosilicates of lithium, sodium, and potassium was presented. Values are listed for 17 different compositions (13 pure compounds and their polymorphs; 4 mixtures, each in lowland high temperature configurational from 298 K to temperatures ranging up to 2000 K. GRA

N82-21292# Bureau of Mines, Albany, Oreg.

PROCEEDINGS OF THE WORKSHOP ON TECHNIQUES FOR MEASUREMENT OF THERMODYNAMIC PROPERTIES

N. A. Gokcen, comp., R. V. Mrazek, comp., and L. B. Pankratz, comp. Sep. 1981 447 p refs Workshop held at Albany, Oreg., 21-23 Aug. 1979

(PB82-129446; BM-IC-8853; LC-80-23912) Avail: NTIS HC A19/MF A01 CSCL 07D

Techniques for measurement of thermodynamic properties were studied. Temperature measurement and control, general calorimetric techniques, low temperature calorimetry, high temperature calorimetry galvanic cells, ionic solutions and heterogeneous phase equilibria are discussed. The resolution of lattice heat capacity is also examined. GRA

N82-21293# Bureau of Mines, Albany, Oreg.

AN ALGORITHM FOR DETERMINING DEBYE TEMPERATURES

R. P. Beyer Sep. 1981 11 p refs

(PB82-129347; BM-RI-8566; LC-81-607998) Avail: NTIS HC A02/MF A01 CSCL 07D

As part of its thermodynamic investigations of mineral compounds, the Bureau of Mines has written an algorithm based on Newton's method for solving for the characteristic Debye temperature of a compound, from heat capacity and temperature data. A listing of a FORTRAN IV program based on this algorithm, for calculating Debye temperatures given heat capacities or for calculating heat capacities given Debye temperatures, is available from the author upon request. GRA

N82-21294# National Academy of Sciences - National Research Council, Washington, D. C.

FORMALDEHYDE AND OTHER ALDEHYDES

May 1981 350 p refs

(Contract EPA-68-01-4655)

(PB82-128075; ISBN-0-309-03146-X; LC-81-81738) Avail: NTIS HC A15/MF A01 CSCL 07D

The potential impact of aldehydes on the urban and indoor environments was studied. Their sources, concentrations, transport, and transformations and their effects on various environmental and biologic systems are investigated. Commercial production, properties, and uses of the aldehydes, aldehyde concentrations,

emission, and environmental generation and transformation reactions, analytical methods for the determination of aldehydes, health effects of formaldehyde, health effects of some other aldehydes, effects of aldehydes on vegetation, and effects of aldehydes on aquatic organisms are reported. GRA

N82-21295# Midwest Research Inst., Kansas City, Mo.
DEVELOPMENT OF ANALYTICAL TEST PROCEDURES FOR ORGANIC POLLUTANTS IN WASTEWATER. APPLICATION TO PESTICIDES Final Report, Sep. 1978 - May 1979
Hope Miller, Paul Cramer, Arbor Drinkwine, Alice Shan, Glenn Trischan, and John E. Going Nov. 1981 92 p refs
(Contract EPA-68-03-2711)
(PB82-132507; EPA-600/4-81-017; Rept-4586-A1) Avail: NTIS HC A05/MF A01 CSCL 07C

Test procedures for a multitude of organics in water were developed. A development program was directed toward a group of 58 pesticides. Each pesticide was tested against the standard method like methylene chloride extraction, Kudarna Danish evaporation, Florisil cleanup gas chromatographic determination. Problem areas such as poor recovery, inadequate cleanup, are identified and modifications to circumvent these problems are devised. A major deviation is the use of HPLC or several classes of pesticides. GRA

N82-21296# Carltech Associates, Columbia, Md.
TECHNICAL FEASIBILITY OF USE OF EASTERN GEOTHERMAL ENERGY IN VACUUM DISTILLATION OF ETHANOL FUEL EXTENSION OF DATA
J. Carl Uhrmacher Sep. 1981 19 p refs
(Contract EX-78-A-38-1008)
(PB82-127077; JHU/APL/OM-81-123) Avail: NTIS HC A02/MF A01 CSCL 07A

The feasibility of vacuum distillation of ethanol fuel with modest temperature geothermal resources is discussed. The flow rates of geothermal water at 155 F are documented as a function of beer-still bottoms pressure. Emphasis is on pressures that are less than 150 mmHg. T.M.

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N82-21297*# National Aeronautics and Space Administration, Washington, D. C.
THE MEASUREMENT OF HEATS OF SOLUTION OF HIGH MELTING METALLIC SYSTEMS IN AN ELECTROMAGNETIC LEVITATION FIELD Ph.D. Thesis - Tech. Univ. Berlin - 1979
Martin G. Frohberg and Gerhard Betz Feb. 1982 17 p refs Transl. into ENGLISH from Archiv fuer das Eisenhuttenwesen (Berlin), v. 51, no. 6, Jun. 1980 p 235-240 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by Tech. Univ. Berlin
(Contract NASw-3542)
(NASA-TM-76829; NAS 1.15:76829) Avail: NTIS HC A02/MF A01 CSCL 11F

A method was tested for measuring the enthalpies of mixing of liquid metallic alloying systems, involving the combination of two samples in the electromagnetic field of an induction coil. The heat of solution is calculated from the pyrometrically measured temperature effect, the heat capacity of the alloy, and the heat content of the added sample. The usefulness of the method was tested experimentally with iron-copper and niobium-silicon systems. This method should be especially applicable to high-melting alloys, for which conventional measurements have failed. R.J.F.

N82-21298*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF ALUMINUM PHOSPHATE ADDITIONS ON COMPOSITION OF THREE-COMPONENT PLASMA-SPRAYED SOLID LUBRICANT
Thomas P. Jacobson and Stanley G. Young Mar. 1982 19 p refs
(NASA-TP-1990; E-713; NAS 1.60:1990) Avail: NTIS HC A02/MF A01 CSCL 11F

Image analysis (IA) and electron microprobe X-ray analysis (EMXA) were used to characterize a plasma-sprayed, self-lubricating coating, NASA LUBE PS106, specified by weight percent as 35NiCr-35Ag-30CaF2. To minimize segregation of the powder mixture during the plasma-spraying procedure, monoaluminum phosphate was added to form agglomerate particles. Three concentrations of AlPO4 were added to the mixtures: 1.25, 2.5, and 6.25 percent by weight. Analysis showed that 1.25 wt% AlPO4 yielded a CaF2 deficiency, 2.5 wt% kept the coating closest to specification, and 6.25 wt% yielded excess CaF2 as well as more impurities and voids and a deficiency in silver. Photomicrographs and X-ray maps are presented. The methods of IA and EMXA complement each other, and the reasonable agreement in the results increases the confidence in determining the coating composition. Author

N82-21299# Atomic Energy Commission Research Establishment, Lucas Heights (Australia).
OPTICAL METALLOGRAPHY OF SOME MARAGING STEELS
E. Meller and J. T. A. Pollock May 1981 15 p refs
(DE81-700654; AAEC/E-513) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The structural features of maraging steels, including those that impose limitations on strength and toughness, are briefly reviewed. Phase relationships in the iron nickel matrix system are introduced which, in conjunction with alloy composition and heat treatment, allow the interpretation of microstructure. Details are presented of methods for revealing the microstructure of maraging steels. The prior austenite grain size following a variety of heat treatments is of special interest since excessive grain size can lead to poor ductility. These methods are illustrated with micrographs of the microstructures of MAR 350 and MAR 400 steels in the cast, solution treated, aged and cold worked states. DOE

N82-21300*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FRICTION WEAR AND AUGER ANALYSIS OF IRON IMPLANTED WITH 1.5-MeV NITROGEN IONS
John Ferrante and William R. Jones, Jr. Mar. 1982 14 p refs
(NASA-TP-1989; E-678; NAS 1.60:1989) Avail: NTIS HC A02/MF A01 CSCL 11F

The effect of implantation of 1.5-MeV nitrogen ions on the friction and wear characteristics of pure iron sliding against steel was studied in a pin-on disk apparatus. An implantation dose of 5 x 10 to the 17th power ions/sq cm was used. Small reductions in initial and steady-state wear rates were observed for nitrogen-implanted iron riders as compared with unimplanted controls. Auger electron spectroscopy revealed a subsurface Gaussian nitrogen distribution with a maximum concentration of 15 at. % at a depth of 8 x 10 to the -7th m. A similar analysis within the wear scar of an implanted rider after 20 microns of wear yielded only background nitrogen concentration, thus giving no evidence for diffusion of nitrogen beyond the implanted range. Author

N82-21301*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FRICTION AND SURFACE CHEMISTRY OF SOME FERROUS-BASE METALLIC GLASSES
Kazuhisa Miyoshi and Donald H. Buckley Mar. 1982 14 p refs
(NASA-TP-1991; E-919; NAS 1.60:1991) Avail: NTIS HC A02/MF A01 CSCL 11F

The friction properties of some ferrous-base metallic glasses were measured both in argon and in vacuum to a temperature of 350 C. The alloy surfaces were also analyzed with X-ray photoelectron spectroscopy to identify the compounds and elements present on the surface. The results of the investigation indicate that even when the surfaces of the amorphous alloys, or metallic glasses, are atomically clean, bulk contaminants such as boric oxide and silicon dioxide diffuse to the surfaces. Friction measurements in both argon and vacuum indicate that

the alloys exhibit higher coefficients of friction in the crystalline state than they do in the amorphous state. Author

N82-21302# Materials Research Labs., Melbourne (Australia).
FRACTURE ANALYSIS OF EXTERNAL DEFECTS IN THE 105 mm TANK (L7A1) GUN BARREL
Graham Clark Feb. 1980 18 p refs
(MRL-R-765; AR-002-145) Avail: NTIS HC A02/MF A01

The use of autofrettage to increase the permissible firing pressures in large caliber gun barrels leads to the development of tensile residual stresses near the external surface of the barrel, and these stresses increase the probability of barrel failure through the growth of a preexisting defect situated near the tube external surface. Fracture mechanics analyses of such defects necessarily involve estimating the residual stresses in addition to the firing stress distribution in the barrel wall. The way in which such estimates may be obtained is discussed. As an example, a defective barrel is investigated for suitability for use outside normal service conditions, resulting in the proposal that the barrel be used for proof and experimental purposes. R.J.F.

N82-21303# Materials Research Labs., Melbourne (Australia).
HIGH-TEMPERATURE OXIDATION OF NIMONIC 105 AT SUB-ATMOSPHERIC OXYGEN PARTIAL PRESSURES
Graham R. Johnston 1980 30 p refs Original contains color illustrations
(MRL-R-789) Avail: NTIS HC A03/MF A01

Studies of some high-temperature oxidation characteristics of the wrought superalloy Nimonic 105 are described. This work is related to the development of a high-temperature brazing process for military gas-turbine airfoil components involving gaseous atmospheres of very low oxygen activity. Author

N82-21304# Materials Research Labs., Melbourne (Australia).
THE LOW TEMPERATURE ANNEALING OF 7.62 mM BRASS CARTRIDGE CASES: STRESS CORROSION SUSCEPTIBILITY
David S. Saunders Jun. 1980 18 p refs
(MRL-R-778) Avail: NTIS HC A02/MF A01

An investigation into the effects of hardening during low temperature annealing on the stress corrosion susceptibility of brass cartridge cases was made. The low temperature annealing occurred in the lower walls during the mouth annealing process in the production of 7.62 mm cartridge cases. Cartridge cases were taken from the production line prior to the mouth anneal and then annealed in an oil bath at 200 C or 250 C for a range of times and then exposed to an ammonia environment for 4 h. Tests showed no evidence of enhanced stress corrosion susceptibility at higher wall hardness resulting from the artificial low temperature annealing. The degrees of cracking in the lower walls of the cartridge cases were found to decrease with increasing times of annealing with no evidence of cracking for times in excess of 6 h at 250 C. The hardening in the cartridge cases on low temperature annealing is explained in terms of modern theories of recovery in cold worked brasses. M.D.K.

N82-21305# Materials Research Labs., Melbourne (Australia).
THE EFFECTS OF C/M RATIO ON THE CONTROLLED FRAGMENTATION OF CYLINDERS USING EXTERNAL NOTCHING
David S. Saunders Dec. 1980 30 p refs
(MRL-R-800) Avail: NTIS HC A03/MF A01

The effects of C/M (HE charge to cylinder mass) ratio on the degree of control of fragmentation exerted by external longitudinal notching were investigated. Two series of experiments were conducted. In one series the cylinder wall thickness was varied to induce weight scaling and in the other both the cylinder dimensions and notch pitching were varied to induce number scaling. Although both weight and number scaling with C/M ratio were feasible for notched cylinders, the results demonstrated that there are limitations to the degree of control exerted by the notching. Both weight and number scaling appear to be limited by the propensity for the operation of natural fragmentation mechanisms between the notches. Weight scaling is also limited by geometric factors. The filling of the notches with an epoxy resin produces an increase in the degree of control of fragmentation for both weight and number scaling cylinders. Author

N82-21306# Materials Research Labs., Melbourne (Australia).
THE INFLUENCE OF GRAIN BOUNDARY SULPHIDES ON HOT DUCTILITY
R. C. Andrew and G. M. Weston Oct. 1981 11 p refs
(MRL-R-832; AR-002-738) Avail: NTIS HC A02/MF A01

The effect of grain boundary sulphide precipitation on the hot ductility of a low alloy ESR steel was investigated within the temperature range 1000-1350 C. It was found that grain boundary sulphides on their own have little influence on hot ductility. However, longer exposure times at high temperatures, in the presence of a partially oxidizing atmosphere caused a considerable drop in ductility for test temperatures below 1200 C. The mechanism involving this loss in ductility was not determined. M.D.K.

N82-21307# Materials Research Labs., Melbourne (Australia).
DESULPHURIZATION OF LOW-ALLOY STEEL IN A DIRECT CURRENT ESR FURNACE
Richard C. Andrew and George M. Weston Apr. 1981 16 p refs
(MRL-R-806) Avail: NTIS HC A02/MF A01

Eleven small ingots (70-mm diameter, 500-mm long) were produced in an experimental electroslag-refining furnace using electrode negative and electrode positive direct current power modes to enable the extent of desulphurization to be compared. The electrode material was a commercial low alloy steel (En 25) containing about 0.03 wt% sulphur. The average sulphur reduction determined for each ingot was found to increase as the ingress of oxygen to the molten slag was reduced, and extensive desulphurization was achieved with both power modes provided the entry of oxygen to the slag bath was sufficiently restricted. Slightly lower levels of sulphur removal was recorded for the electrode positive power mode, but whether this was due solely to electrochemical reactions or to the asymmetric pattern of heat generation is uncertain. Author

N82-21308# Materials Research Labs., Melbourne (Australia).
SURFACE MODIFICATION CONCEPTS FOR ENHANCEMENT OF THE HIGH-TEMPERATURE CORROSION RESISTANCE OF GAS TURBINE SUPERALLOYS
Noel A. Burley 1980 40 p refs
(MRL-R-798; TTCP-P-TP-1/AUS/3/80) Avail: NTIS HC A03/MF A01

The current view of the mechanisms of the phenomenon of hot corrosion, whereby the surface integrity of gas turbine superalloys is degraded, and also the principal types of protective coating applied to aerofoil components made of these materials to inhibit hot corrosion and extend their useful lives is summarized. A concept is presented that the high-temperature corrosion resistance of superalloys can be significantly enhanced by selective modification of the composition and structure of their parasurface zones, utilizing new methods of surface treatment such as ion implantation, laser alloying, and thermal passivation. Author

N82-21309# Materials Research Labs., Melbourne (Australia).
AN ASPECT OF THE INTERNAL CORROSION OF DEFA CASES
Peter J. Knuckey and Jeffrey J. Batten May 1980 13 p refs Original contains color illustrations
(MRL-TN-440) Avail: NTIS HC A02/MF A01

The internal corrosion of zinc-plated steel DEFA cases were observed to be due to the reaction between the zinc coating and internally derived nitric and formic acids in the vapor phase. These gave the corrosion products basic zinc nitrate and zinc formate. The predominance of formate in the outermost layers of the corrosion product and of nitrate in the lower layers suggests that corrosion processes changed at one stage. Observations are in conformity with the products formed during thermal decomposition of nitrocellulose. The products include nitrogen dioxide, water, and formaldehyde, where nitrogen dioxide is observed in the early stages of the reaction but disappears as the reaction proceeds. Formaldehyde appeared to buildup to a steady concentration. The corrodent nitric acid is explained by the presence of the products nitrogen dioxide and water, while formic acid could arise from the oxidation of formaldehyde by nitrogen dioxide. Author

N82-21310# Council for Scientific and Industrial Research, Pretoria (South Africa).
INFLUENCE OF THE GRINDING PROCESS ON THE SURFACE LAYER STRUCTURE OF 12X2H4A STEELS
A. N. Semieev and Yu. M. Breev 1981 4 p refs Transl. into ENGLISH from Sinten. Almazy (USSR), no. 5, 1978 p 19-20 (CSIR-Trans-1581) Avail: NTIS HC A02/MF A01

An evaluation of the interaction between martensitic/austenitic stainless steels and abrasives and the effect on the formation of contact surfaces was made. The following effects were considered during investigations: temperature increases, resultant phase changes, resistance to crack formation, resistance of hard alloys to plastic deformation, structural defects, effects of diamond-electrolyte grinding, and voltage changes with thermal treatment. Results of the investigation indicate that the effect of thermic treatment on the resistant deformation of the materials depends on the content of the binding phase in hard alloys.
M.D.K.

N82-21311# Northwestern Univ., Evanston, Ill. Technological Inst.
FATIGUE CRACK INITIATION AND PROPAGATION IN HIGH STRENGTH ALUMINUM P/M ALLOYS Final Report, 30 Sep. 1978 - 29 Sep. 1981
Morris E. Fine 30 Nov. 1981 63 p refs
(Grant AF-AFOSR-3732-78)
(AD-A110217; AFOSR-81-0882TR) Avail: NTIS HC A04/MF A01 CSCL 11/6

Fatigue crack initiation in extruded X7091 RSP-P/M aluminum type alloys occurs at grain boundaries at low and at high stresses and thus the expected increase in crack initiation resistance from the smaller constituent particle size and grain size than in ingot alloys is not achieved. By a process of elimination the grain boundary embrittlement was attributed to Al2O3 particles formed during atomization and segregated to some grain boundaries. It is not due to the small grain size, to Co2Al9, to precipitates at grain boundaries nor to a precipitate free zone. Thermomechanical processing after extrusion of X7091 (done by Alcoa) with 0.8% Co to produce large recrystallized grains resulted in initiation of fatigue cracks at slip bands and a much greater resistance to initiation of fatigue cracks at low stresses. Microcrack growth is faster in the thermomechanically treated samples as well as in ingot alloys than in the extruded and aged X7091. However, the threshold stress intensity range in the former is larger, 1.6 MN/cu m per sq m, compared to 0.9 MN/cu m per sq m for extruded and heat treated samples. It would appear desirable to investigate fatigue crack initiation in much finer grained thermomechanically treated X7091-RSP-P/M alloys. These might have the higher resistance to fatigue crack initiation.
Author (GRA)

N82-21312# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
REVIEW OF CORROSION FATIGUE
E. U. Lee 16 Nov. 1981 43 p refs
(AD-A110427; NADC-81271-60) Avail: NTIS HC A03/MF A01 CSCL 20/11

The work on corrosion fatigue by a number of investigators is reviewed, and the current understanding of this phenomenon is discussed. Corrosion fatigue behavior can be grouped into three types, and it is affected by numerous variables - environmental, mechanical, and metallurgical. There are several models for corrosion fatigue crack growth, which incorporate the fatigue crack growth in an inert reference environment, the sustained load crack growth, and the loading variables. The proposed mechanisms for corrosion fatigue phenomenon are pitting, metal dissolution, protective film rupture, surface energy reduction, and hydrogen embrittlement. Hydrogen embrittlement is regarded as the most influential mechanism.
GRA

N82-21313# Naval Postgraduate School, Monterey, Calif. Dept. of Mechanical Engineering.
THE EFFECTS OF SIMULATED WELDS ON HY-130 CAST AND WROUGHT PLATE AND WELD METAL MICROSTRUCTURE M.S. Thesis
Paul E. Cincotta Sep. 1981 62 p refs
(AD-A110377) Avail: NTIS HC A04/MF A01 CSCL 11/6

The microstructure and hardness of simulated welds in HY-130 cast plate, wrought plate and weld filler metal are investigated. The dependence of these quantities on the austenitizing temperature and the tempering provided by subsequent weld passes is also investigated. The use of a tempering parameter, as developed by Holiom and Jaffe, allows comparison of different tempering times and temperatures. It was found that in the rapid heating cycle of simulated welding that the AC1 and AC3 temperatures are approximately as much as 150 to 170 F higher than the corresponding temperatures of the equilibrium phase diagram for this 0.1% C-5.0% Ni steel. Results indicate that case plate tends to resist tempering more than either the rolled plate or weld metal. Additionally, structures formed at lower austenitizing temperatures temper more readily. Although all three conditions tempered, the cast plate retained a steep hardness and microstructural gradient through the HAZ and consequently is probably more susceptible to a metallurgical notch effect.
Author (GRA)

N82-21314# Naval Research Lab., Washington, D. C.
THICKNESS AND TEMPERATURE EFFECTS ON THE J-INTEGRAL COD RELATIONSHIP Progress Report
V. Provenzano, C. M. Gilmore (George Washington Univ.), F. A. Smidt, Jr., and J. R. Hawthorne 31 Dec. 1981 27 p refs
(RR0221141)
(AD-A110095; NRL-MR-4696) Avail: NTIS HC A03/MF A01 CSCL 11/6

The fracture surfaces of compact tension (CT) specimens of HT-9 martensitic stainless steel previously tested at room temperature and at 200 degrees C have been examined by scanning electron microscopy (SEM) to characterize the failure processes and establish correlations with fracture toughness properties; the fracture toughness of HT-9 for two specimen thicknesses (2.5 and 12.7 mm) was determined by conducting J-integral tests using the single specimen unloading compliance method.
Author (GRA)

N82-21315# Materials Research Labs., Ascot Vale (Australia).
THE INFLUENCE OF GRAIN BOUNDARY SULPHIDES ON HOT DUCTILITY
R. C. Andrew and G. M. Weston Oct. 1981 18 p refs
(AD-A110057; MRL-R-832) Avail: NTIS HC A02/MF A01 CSCL 20/11

The effect grain boundary sulphide precipitation on the hot ductility of a low-alloy ESR steel has been investigated within the temperature range 1000-1350 deg C. It was found that grain boundary sulphides on their own have little influence on hot ductility. However, longer exposure times at high temperatures, in the presence of a partially oxidizing atmosphere caused a considerable drop in ductility for test temperatures below 1200 deg C. The mechanism involving this loss in ductility was not determined.
Author (GRA)

N82-21316# Materials Research Labs., Melbourne (Australia).
INFLUENCE OF REMELTING CONDITIONS ON THE PERFORMANCE OF LOW ALLOY ESR STEEL IN THE AS-CAST CONDITION, SMALL LABORATORY INGOTS
Richard C. Andrew, George M. Weston, and Graham Clark Oct. 1980 36 p refs
(MRL-R-786; AR-002-364) Avail: NTIS HC A03/MF A01

The mechanical properties of three ingots of a low-alloy steel produced in an experimental electroslag refining furnace are assessed in the as-cast, heat-treated condition. In general, the tensile, notch impact toughness, fracture toughness and fatigue properties of these ingots compare favorably with those determined for a wrought, vacuum-degassed electric furnace steel of similar composition. Variations in mechanical properties within, as well as between, ingots are correlated with differences in chemical composition, inclusion content, inclusion morphology and solidification geometry brought about by changes in the remelting conditions.
Author

N82-21317# Pennsylvania State Univ., University Park. Metallurgy Section.
HYDROGEN EFFECTS IN METALS Technical Progress Report
H. W. Pickering and M. Zamanzadeh 15 Jan. 1982 18 p
(Contract N00014-81-K-0025)
(AD-A110881) Avail: NTIS HC A02/MF A01 CSCL 07/4

A model is presented for decreasing hydrogen absorption by catalyzing the hydrogen evolution reaction (h.e.r.). Its salient features are the presence of a metal on the substrate surface with a higher exchange current density for the h.e.r. than that of the substrate, and a mechanism of hydrogen evolution for which the coverage of the surface is a function of the overpotential. Pt-implanted Fe membranes are evaluated with regard to their catalytic character for the h.e.r. using a Devanathan-Stachurski permeation cell. These data are in full accord with, and illustrate, the above model for decreasing H absorption. Factors affecting the choice of implants for decreasing hydrogen absorption (via modification of the overpotential and the hydrogen coverage) include the nature of the implanted species for catalyzing the h.e.r., the concentration profile of the implanted species, in particular its concentration in the surface atomic layer(s), and the tendency for enrichment of the surface in the implanted species, as occurs during open circuit corrosion. These factors are illustrated in the data. Author

N82-21318# Bendix Corp., Kansas City, Mo.
COPPER PYROPHOSPHATE/PY61H PLATING BATH: CHEMICAL VARIABLES, SYNERGISM, AND ELECTRODEPOSITION MECHANISM
K. J. Borhani Nov. 1981 26 p refs
(Contract DE-AC04-76DP-00613)
(DE82-003099; BDX-613-2665) Avail: NTIS HC A03/MF A01

The study identified chemically PY61H, a proprietary agent used in copper pyrophosphate baths for its brightening and leveling properties for plated through-holes of printed wiring boards (PWBs). Numerous weapons programs incorporate printed wiring boards. PY61H consisted primarily of the dipotassium salt of 2,5-dimercapto-1,3,4-thiadiazole. Laboratory-scale prototypes of production baths demonstrated that the dimercaptothiadiazole salt can produce a bright plate analogous to the PY61H mixture. The effective brightener concentration for both PY61H and dimercaptothiadiazole was determined by cyclic voltammetry performed at a rotating platinum disk electrode. New peak attributed to brightener degradation products became electrolysis and brightener addition steps. Scattering of the points from plots of brightener concentration varying with voltammetric response revealed the need to operate the bath within narrower ranges for the inorganic constituents, especially ammonia. This report describes the mechanism postulated to be responsible for the leveling in the copper pyrophosphate bath. DOE

N82-21319# Argonne National Lab., Ill.
POLISHING METHODS FOR METALLIC AND CERAMIC TRANSMISSION ELECTRON MICROSCOPY SPECIMENS
B. J. Kestel Jul. 1981 64 p refs
(Contract W-31-109-eng-38)
(DE82-003251; ANL-80-120) Avail: NTIS HC A04/MF A01

In recent years, the increasing sophistication of transmission electron microscope (TEM) studies of materials necessitated more exacting methods of specimen preparation. Improved equipment and techniques for electropolishing and chemically polishing a wide variety of specimens is described. Many of the specimens used in developing or improving the techniques were irradiated with heavy ions such as nickel or vanadium to study radiation damage. The high cost of these specimens increased the need for reproducible methods of initial preparation, postirradiation processing, and final thinning for TEM examination. A technique was also developed to salvage specimens that were previously thinned but were unusable for various reasons. Jet polishing is, in general, the method of choice for surface polishing, sectioning, and thinning. The older beaker electropolishing method was included because it was inexpensive and simple, and gives some insight into how the more recent methods were developed. DOE

N82-21320# Central Electricity Generating Board, Berkeley (England).
TENSILE BEHAVIOUR OF NITRIDED 20%Cr/25%Ni/Ti STAINLESS STEEL ALLOYS
Sep. 1980 21 p refs
(CEGB-RD/B/N-4908) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The tensile behavior of nitrided 20%Cr/25%Ni/Ti stainless steel was examined at room temperature, 600 C and 700 C. The influence of a number of minor alloying additions on the tensile strength of this steel was determined to establish whether the properties could be improved by grain size refinement or by hardening of the matrix; the effect of prior cold work was also investigated. The results are compared with the tensile properties of 'un-nitrided' 20%Cr/25%Ni/Ti stainless steel, standard 20%Cr/25%Ni/Nb stainless steel and Nimonic PE16. The possible use of nitrided stainless steel as alternative tie-bar material in CAGRs is also discussed. DOE

N82-21321# Argonne National Lab., Ill.
EVALUATION OF COPPER-NICKEL ALLOYS FOR OTEC APPLICATIONS
R. O. Lewis and F. L. LaQue (LaQue Center for Corrosion Technology, Wrightsville Beach, N.C.) Apr. 1981 103 p refs
(Contract W-31-109-eng-38)
(DE82-003919; ANL/OTEC-BCM-019) Avail: NTIS HC A06/MF A01

Copper-nickel alloy C70600 is found to exhibit excellent corrosion resistance against seawater flow rates up to 3.0 m/s. The copper-nickels are found to be galvanically compatible as a family and with other copper-base alloys in seawater. Their corrosion rate is found not to be significantly influenced by ambient variations in oxygen content, temperature, or other parameters which change with depth. Low level chlorination does not adversely affect these alloys. Adverse effects of sulfide are not anticipated. The copper nickel alloys have excellent resistance to macrobiological fouling in seawater, but microfouling still occurs to a limited extent. The danger of leakage of ammonia into seawater, and vice versa, is found to effectively remove copper-nickel alloys as candidates for use in OTEC heat exchangers in contact with ammonia as a working fluid. T.M.

N82-21322# Commission of the European Communities, Brussels (Belgium). Central Bureau for Nuclear Measurements.
CERTIFICATION OF NITROGEN IN NON-FERROUS METALS: NITROGEN IN ZIRCONIUM
J. Pauwels and L. Haemers (Joint Research Centre, Ispra, Italy) 1980 16 p refs In ENGLISH; FRENCH summary
(EUR-6939; BCR-No-21-56-57) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

This report describes the certification of nitrogen in three zirconium reference materials for oxygen (BCR No. 21, 56 and 57) is described. The analytical methods and the statistical evaluation of the results are given. The certified values for nitrogen are respectively (26.6 + or - 2.7), (11.7 + or - 1.8) and (12.0 + or - 1.7) micro g/g. DOE

N82-21323# Rolls-Royce Ltd., Derby (England). Aero Engine Group.
THE EFFECT OF MICROSTRUCTURE ON THE LOW CYCLE FATIGUE STRENGTH OF INCO 901
P. J. Postans and R. H. Jeal 1980 9 p
(PNR-90059) Avail: NTIS HC A02/MF A01

Samples of Inco 901 were forged to produce grain structures ranging from fully recrystallized equiaxed grains of average diameter 0.046 mm to 0.18 mm (ASTM 6 to ASTM2) to structures with less than 20% recrystallization. After forging, the 100 mm thick sections were heat treated: 2 hr /980 C water quench + 14 hr /720 C air cool + 12 hr /650 C air cool. Tensile and low cycle fatigue tests at 500 C, and crack propagation and fracture toughness tests at 600 C were carried out on all the structures. The highest low cycle fatigue strength is obtained with a partially recrystallized structure of 70% equiaxed grains and 30% worked and recovered grains. The tensile properties, facture toughness and crack propagation rate are relatively insensitive to grain structure. Author (ESA)

N82-21324# Ghent Univ. (Belgium). Lab. for Strength of Materials and Welding Technology.
EFFECTS OF A STRESS RELIEF HEAT TREATMENT ON THE TOUGHNESS OF PRESSURE VESSEL QUALITY STEELS. INFLUENCE OF PLATE THICKNESS
William Provost Brussels, Belgium Centre de Recherche et Technologie de l'Industrie des Fabric. Metallique Jan. 1981 41 p refs Sponsored by the Inst. pour l'Encouragement de la Recherche Scientifique dans l'Industrie et l'Agriculture
(CRIF-MT-141) Avail: NTIS HC A03/MF A01

The influence of post weld heat treatments on the toughness of welded joints in pressure vessel quality steels, 17 Mn 4 and D52-2Nb, was determined. In particular, the minimum plate thickness was found for which a post weld heat treatment should be recommended. The present code requirements for post weld heat treatments are surveyed. Besides qualification tests, several large scale tests were carried out on test plates of various thicknesses. The results indicate that although the present code requirements are satisfactory for a C-Mn steel, they should be completely altered for a Nb-microalloyed steel, welded with a high heat input. Author (ESA)

N82-21325# Defence Research Information Centre, Orpington (England).

PREOXIDATION AND ONSET OF DESTRUCTIVE CORROSION IN SOME NICKEL SUPERALLOYS

R. Sesini, M. Villa, L. Borghi, P. Cavallotti, and U. Ducati Jan. 1981 13 p refs Transl. into ENGLISH from Metal. Ital. (Italy), v. 10, 1979 p 425-430 1979 p 425-430
(DRIC-T-6261; BR76789) Avail: NTIS HC A02/MF A01

The processes and related mechanisms responsible for high temperature corrosion of nickel superalloys for gas turbines were investigated. The role of the formation of volatile compounds (based on hexavalent chromium compositions), at the onset of destructive corrosion conditions was studied. A thermogravimetric method was used. Layers of pre-formed oxide, depending on the conditions under which they were obtained, can afford effective protection, provided that conditions of uniformity and compactness are present. The high degree of chemical and metallurgical homogeneity characteristic of alloys obtained by hot isostatic compression is beneficial because it limits sites favoring attack. Author (ESA)

N82-21326# Rolls-Royce Ltd., Derby (England). Aero Div.

MECHANICAL PROPERTIES OF TITANIUM ALLOYS

J. B. Borradaile and R. H. Jeal 1981 13 p refs
(PNR-90062) Avail: NTIS HC A02/MF A01

The composition, processing, heat treatment and their modifications on structure and mechanical properties of titanium alloys were critically reviewed. For high temperature applications a fine grained, transformed, beta near alpha alloy offers a weldable material with better creep, crack and fracture properties than alpha plus beta alloys. For low temperature applications alpha plus beta processed alloys are preferred because of their better tensile strength and ductility. If a lifting philosophy is developed based upon fracture mechanics, beta heat treated alloys are preferred because of their low crack propagation rates at low temperatures. Author (ESA)

N82-21327# Defence Research Information Centre, Orpington (England).

ON THE RELATION BETWEEN TEMPER EMBRITTLEMENT SUSCEPTIBILITY AND STRENGTH AFTER TEMPERING OF MARTENSITIC 3% Ni-Cr-Mo-V STEEL

S. Sawada and T. Ohashi Apr. 1981 21 p refs Transl. into ENGLISH from Tetsu to Hagane (Japan), v. 9, 1978 p 61-68
(DRIC-T-6344; BR78675) Avail: NTIS HC A02/MF A01

The effect of strength on susceptibility to temper embrittlement in a quenched martensitic 3% Ni-Cr-Mo-V steel was examined by applying isothermal embrittling treatment and by varying tempering conditions. The fractured surfaces of Charpy impact specimens tested at different temperatures were investigated by scanning electron microscopy. The temper embrittling rate is found to be dependent on tempering temperatures of 600, 630 of 660 C after quenching. Steels tempered at higher temperatures embrittle more rapidly and to a higher extent. In the region of transition temperature, intercrystalline fracture is the dominant factor in brittle fracture. Author (ESA)

N82-21328# National Maritime Inst., Teddington (England).

THE COASTAL RESEARCH FACILITY FOR STUDYING CORROSION AND PROTECTION OF HOT RISER AND PIPE STEELS IN SEA WATER AND SEA-BED MUD

K. F. Hale Dec. 1980 20 p Sponsored by DOE
(NMI-R-97; OT-R-8085) Avail: NTIS HC A02/MF A01

The concept and provision of a research facility for the measurement of the corrosion rates of hot steel in sea water and in seabed mud as a function of potential imposed by sacrificial zinc and aluminium anodes is described. The protection current is limited by series resistors. Data to predict the effects of corrosion on the long-term structural integrity of hot oil riser pipes and seabed pipelines is provided. Author (ESA)

N82-21329# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium). Construction Metallique Section.

WELDABILITY AND FRACTURE TOUGHNESS OF 5% Ni STEEL. PART 1: WELD SIMULATION TESTING. PART 2: WIDE PLATE TESTING

A. Dhooge (Belgian Inst. of Welding), K. Ostyn, W. Provost, and A. Vinckier (Ghent Univ., Belgium) Aug. 1981 20 p refs Sponsored by Inst. pour l'Encouragement de la Recherche Scientifique dans l'Industrie et l'Agriculture and Research Centre of the Belgian Inst. for Welding
(CRIF-MT-144) Avail: NTIS HC A02/MF A01

The weldability of a double normalized and tempered 5% Ni steel was investigated. Weld simulation was used for estimation of the heat affected zone (HAZ) ductility at cryogenic temperatures. Charpy-5 specimens were subjected to weld simulation cycles and heat treatments and subsequently broken at a range of cryogenic temperatures. Very high peak temperatures result in a sharp drop in impact strength. Very low base metal and HAZ ductilities can result from artificial aging. It is suggested that care must be taken when cold deformation is applied or distortions are corrected in structures made of 5% Ni steel. It is indicated that welded 5% Ni steel composites can be used safety in the temperature range of -90 to -165 C. A higher fracture toughness is obtained for specimens welded with Ni alloy consumable than for specimens welded with a modified austenitic stainless steel consumable. Author (ESA)

N82-21330# California State Dept. of Transportation, Sacramento. Office of Transportation Lab.

CATHODIC PROTECTION STUDIES ON REINFORCED CONCRETE Final Report

G. H. C. Chang, John A. Apostolos, and Forrest A. Myhres Mar. 1981 97 p refs Sponsored by Federal Highway Administration, Sacramento, Calif.
(PB82-122094; FHWA/CA/TL-81-02; TL-635355) Avail: NTIS HC A05/MF A01 CSCL 11F

Field and laboratory studies relating to monitoring techniques, materials, instrumentation used on reinforced concrete bridge decks under cathodic protection are presented. Followup data on Sly Park Bridge, the first known deck to be placed under experimental cathodic protection and first reported in 1974. Effects of concrete temperature and moisture changes on potential measurements are documented and discussed. Use of an oscilloscope voltmeter to avoid turning off the cathodic protection current is presented. Use of corrosometer probes and isolated reinforcing bars as current and corrosion monitors is discussed. Impressed current anode data are presented. An attempt to develop a conductive concrete overlay using 100% coke as the aggregate is documented. High-silicon iron anodes were inspected after five years intermittent operation, and were found to be performing very well in a conductive layer of coke and asphaltic binder. Inspections and brief studies of mild steel, platinum coated, and copper anodes are also reported. GRA

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N82-21331*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SOME PROPERTIES OF RF SPUTTERED HAFNIUM NITRIDE COATINGS

Paul R. Aron and Alfred Grill (Ben Gurion Univ. of the Negev) 1982 12 p refs Presented at the Intern. Conf. on Met. Coating and Process Technol., San Diego, Calif., 5-8 Apr. 1981
(NASA-TM-82826; E-1182; NAS 1.15:82826) Avail: NTIS HC A02/MF A01 CSCL 11F

Hafnium nitride coatings were deposited by reactive RF

sputtering from a hafnium target in nitrogen and argon gas mixtures. The rate of deposition, composition, electrical resistivity and complex index of refraction were investigated as a function of target substrate distance and the fraction nitrogen, (fN2) in the sputtering atmosphere. The relative composition of the coatings is independent on fN2 for values above 0.1. The electric resistivity of the hafnium nitride films changes over 8 orders of magnitude when fN2 changes from 0.10 to 0.85. The index of refraction is almost constant at 2.8(i-0.3i) up to fN2 = 0.40 then decreases to 2.1(1 - 0.01i) for higher values of fN2. S.L.

N82-21332*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THERMAL AND OXIDATIVE DEGRADATION STUDIES OF FORMULATED C-ETHERS BY GEL-PERMEATION CHROMATOGRAPHY
William R. Jones, Jr. and Wilfredo Morales Mar. 1982 14 p refs
(NASA-TP-1994; NAS 1.60:1994; E-976) Avail: NTIS HC A02/MF A01 CSCL 07D

Gel-permeation chromatography was used to analyze C-ether lubricant formulations from high-temperature bearing tests and from micro-oxidation tests. Three mu-styragel columns (one 500 and two 100 A) and a tetrahydrofuran mobile phase were found to adequately separate the C-ether degradation products. The micro-oxidation tests yielded degradation results qualitatively similar to those observed from the bearing tests. Micro-oxidation tests conducted in air yielded more degradation than did tests in nitrogen. No great differences were observed between the thermal-oxidative stabilities of the two C-ether formulations or between the catalytic degradation activities of silver and M-50 steel. C-ether formulation I did yield more degradation than did formulation II in 111- and 25-hour bearing tests, respectively. Author

N82-21333# Materials Research Labs., Melbourne (Australia).
STUDIES OF THE EFFECTS OF SUB-ZERO STORAGE TEMPERATURES ON THE PROPERTIES OF PRE-MIXED POLYSULPHIDE SEALANTS
John W. Barber, Peter J. Hanhela, Robert H. E. Huang, and D. Brenton Paul Oct. 1980 25 p refs
(MRL-R-656) Avail: NTIS HC A02/MF A01

Premixed polysulphide sealants were stored at -20, -30 and -40 C for selected intervals and then tested for conformity to the requirements in regard to cure rate or hardness, application time, tack-free time, and peel strength. For Pro-Seal 899 and PR-1750 sealants, no significant change in hardness or peel strength occurred after prolonged storage at temperatures of -20 C and below; a minor decline in peel strength occurred with PR-1422. Application properties were also maintained for extended periods and at -40 C tests terminated only due to consumption of samples after storage times ranging from 7 to 16 weeks. Batch variations and stricter observation of class requirements could influence recommended storage times but at -40 C even materials such as PR-1750, which have a close tolerance in application life rating, may be premixed and be safely stored for at least 10 weeks. Both class A and B sealants may be stored in pre-mixed form provided their application lives are at least 2 hours. Thawing is most conveniently and efficiently achieved by allowing the frozen sealant to equilibrate at room temperature. J.M.S.

N82-21334# Materials Research Labs., Melbourne (Australia).
PRELIMINARY ASSESSMENT OF ANTIFUNGAL LATEX EMULSIONS BASED ON A CHEMICALLY ANCHORED ANTIFUNGAL COMPOUND
I. C. Dunstan Sep. 1981 14 p refs
(MRL-R-829; AR-002-734) Avail: NTIS HC A02/MF A01

A series of latex emulsions formulated with an experimental fungicide pentachlorophenyl acrylate (PCPA) copolymerized in linear arrangement were tested for fungicidal activity. Tests were performed inoculating the emulsion films with several fungal species on nutrient agar. PCPA showed differential fungicidal activity against the various fungal species. The results suggest that more extensive tests, such as outdoor exposure trials, are warranted. Author

N82-21335# Materials Research Labs., Melbourne (Australia).
SYNTHESIS OF FUNGICIDAL VINYL AND ACRYLIC LATTICES BY EMULSION POLYMERIZATION
L. V. Wake 1981 15 p refs
(MRL-R-822) Avail: NTIS HC A02/MF A01

Latex emulsions were prepared in which experimental fungicidal compounds were copolymerized into the resin matrix. The lattices were laboratory tested for antifungal activity and subsequently formulated as internal/external paints. The paints were exposed under tropical conditions for evaluation of long-term growth-free performance. The monomers pentachlorophenyl acrylate (PPA) and pentachlorophenyl methacrylate (PPMA) were synthesized and incorporated into lattices by emulsion polymerization at various levels in the general vicinity of 2% w/w and 3% w/w. Emulsion copolymers were prepared by combining various mixtures of vinyl acetate, methyl methacrylate, methacrylic acid, ethyl and butyl acrylates with the experimental monomers. By appropriate formulation, stable fine-particle emulsions were prepared exhibiting both antifungal activity and suitable film-forming properties. Author

N82-21336# Materials Research Labs., Melbourne (Australia).
ELASTOMERS IN UNDERWATER APPLICATIONS
David Oldfield and Ted Symes Jul. 1981 21 p refs Presented at the 5th Australasian Rubber Technol. Conv., Canberra, Australia, Oct. 1980
(MRL-R-824; AR-002-426) Avail: NTIS HC A02/MF A01

The successful longterm operation of a sonar system was dependent on the correct choice of material for an elastomeric membrane intended to prevent moisture ingress into the underwater transducer array. The amount of moisture removed after a period in service was in good agreement with the amount predicted from laboratory measurements. The influence of compounding ingredients on the water vapor permeability of bromobutyl rubber vulcanizates was studied in order to produce low permeability elastomeric membranes for sonar applications. The factors affecting the water vapor permeabilities of nitrile rubber vulcanizates are reported. S.L.

N82-21337# FMC Corp., San Jose, Calif.
IMPROVED COATING SYSTEM FOR HIGH STRENGTH TORSION BARS Final Report
Avery J. Austin, Nicholas F. Hayes, and Kazys Navasaitis Warren, Mich. Army Tank-Automotive Command 23 Apr. 1981 55 p (Contract DAAK30-80-C-0004)
(AD-A109951; TACOM-TR-12576) Avail: NTIS HC A04/MF A01 CSCL 11/3

Eight candidate coatings were selected during Phase I and tested in comparison to the current tape and primer system used on the body section of suspension torsion bars. Laboratory tests involving coated panels and one-third length torsion bars were employed in determining the most cost-effective candidate. Production M113A2 torsion bars were coated with the selected product during Phase II and life tested in comparison to the current system. Each group of bars was subjected to a standard damage/corrosion method prior to endurance testing. A statistical analysis of bar life data quantified the increased protection level afforded by the Improved Coating System. Author (GRA)

N82-21338# Northwestern Univ., Evanston, Ill. Dept. of Chemistry.
RATIONAL CONTROL OF ELECTRONIC STRUCTURE AND LATTICE ARCHITECTURE IN ELECTRICALLY CONDUCTING MOLECULAR/MACROMOLECULAR ASSEMBLIES Interim Report
Tobin J. Marks, Carl W. Dirk, Karl F. Schoch, Jr., and J. W. Lyding 23 Dec. 1981 25 p refs
(Contract N00014-81-K-0445; NR Proj. 053-640)
(AD-A110192; TR-16) Avail: NTIS HC A02/MF A01 CSCL 11/9

This article discusses an approach to control molecular stacking interactions in low-dimensional mixed molecular assemblies by locking partially oxidized metallomacrocycles together in a face-to-face orientation. Thus, doping of the cofacially linked polymers M(Pc)O sub n (M = Si, Ge, Sn; Pc = phthalocyaninato) with halogen (I2, Br2) or quinone (e.g., DDQ, TCNQ) electron acceptors produces robust, electrically conductive polymers with a wide range of stoichiometries and properties.

The new materials have been studied by a variety of physical methods including X-ray diffraction, resonance Raman and infrared spectroscopy, ESR, static magnetic susceptibility, variable-temperature four-probe d.c., electrical conductivity, and voltage-shorted compaction techniques. Evidence is presented that some of the macromolecules have metal-like conductivity in the stacking direction and that transport properties within the series can be readily manipulated by rational variation of lattice architecture (e.g., the identity of the metal, M) and acceptor characteristics. Insight into those acceptor properties which stabilize the mixed valent state is provided. Author (GRA)

N82-21339# Stanford Univ., Calif. Physics Lab.
PVF2 TRANSDUCERS FOR NONDESTRUCTIVE EVALUATION OF CERAMICS AND BRITTLE MATERIALS Final Report, 1 Jul. 1977 - 31 Dec. 1980
D. Weinstein and H. J. Shaw Oct. 1981 67 p refs
(Grant AF-AFOSR-3386-77; AF Proj. 2306)
(AD-A110185; SU-GL-3340; AFOSR-81-0881TR) Avail: NTIS HC A04/MF A01 CSCL 11/9

An experimental system using PVP2 piezoelectric film as the active element has been demonstrated. It provides electronically-controlled, high-speed two-dimensional ultrasonic imaging on the surface of a ceramic sample. Scanning bulk waves are converted to surface waves at the ceramic surface. The system produces an electronically focused, highly convergent surface wave beam with an f/1 aperture, with variable focal length and is capable of arbitrary scanning patterns by changing the phase distribution of RF signals applied to a linear array of electrodes via a microcomputer. Simulated flaws on the surface were used in an initial investigation of the beam shape and imaging characteristics, which are found to be consistent with theoretical predictions. Using a frequency of 5 MHz, a resolution in the range of 1.5 to 2 mm is observed. The field of view of 10 cm in the present system could be increased to larger values by straight-forward extensions of the present design. The PVF2 transducer array is easily, quickly and inexpensively fabricated using standard photolithographic techniques. The system uses a scanning transmitter array and nonscanning receiving transducer. Substitution of a second, identical array as receiver would also be straightforward, to produce a unique double-scanning surface wave system with higher resolving power, dynamic range, and discrimination against artifacts. The PVF2 film is capable of operation at much higher frequencies, for higher resolving power, which could be expioited using a higher-frequency electronics section. GRA

N82-21340# Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.
EFFECT OF QUENCH RATE ON THE STRUCTURAL RELAXATION OF A METALLIC GLASS Interim Report
A. L. Greer Jan. 1982 32 p refs Submitted for publication
(Contract N00014-77-C-0002)
(AD-A109906; TR-12) Avail: NTIS HC A03/MF A01 CSCL 11/2

Measurements of the ferromagnetic Curie temperature, Tc, have been used to monitor the structural relaxation of the metallic glass Fe81.5B14.5Si4. The glass was produced by melt-spinning to various ribbon thicknesses at consequently different quench rates. It is shown that faster quenched (i.e., thinner) ribbons have lower initial Tc's, corresponding to less relaxed structures. All the materials, however, tend to the same equilibrium on annealing. An effect which is particularly marked at low annealing temperatures is that faster quenched ribbons relax faster. The results are interpreted in terms of two relaxation mechanisms. GRA

N82-21341# Rockwell International Corp., Canoga Park, Calif. Rocketdyne Div.
ENERGETIC AZIDO COMPOUNDS Final Report, 1 May 1980 - 30 Nov. 1981
M. B. Frankel, E. R. Wilson, D. Woolery, R. L. Kistner, C. Hamermesh, C. McArthur, and L. R. Grant 27 Jan. 1982 48 p refs
(Contract N00014-79-C-0043)
(AD-A110292; RI/RD82-119) Avail: NTIS HC A03/MF A01 CSCL 11/9

A program on the synthesis and characterization of energetic azido prepolymers, based on BAMO, for potential use in advanced solid propellants, gun propellants, and explosives was successfully carried out. Homopolymerization of BAMO gave polymers with molecular weights ranging from 1800 to 3000 and functionalities of two or greater. However, all of the polymers were solids, with a melting point of 75 to 78 C; the melting points were not affected by changing the molecular weight. A melting point, however, as low as -5 C was achieved for a 50/50 mol % BAMO/THF copolymer. Emphasis on the program was therefore concentrated on optimizing the preparation of this copolymer so that it would be suitable for scaleup. GRA

N82-21342# Gulf Research and Development Co., Pittsburgh, Pa.
SYNTHESES OF SYNTHETIC HYDROCARBONS VIA ALPHA OLEFINS Final Report, Jul. 1980 - Jun. 1981
B. L. Cupples, A. N. Kresge, A. Onopchenko, and J. P. Pellegrini, Jr. Wright-Patterson AFB, Ohio AFWAL Oct. 1981 56 p refs
(Contract F33615-80-C-5086; AF Proj. 2421)
(AD-A110380; AFWAL-TR-81-4109) Avail: NTIS HC A04/MF A01 CSCL 07/4

This work involved (1) review of literature data, (2) acquisition of experimental data, and (3) development of a correlation diagram for relating the structure of paraffinic hydrocarbons with physical properties such as viscosity, pour point, and thermal stability. Further work involved (4) evaluation of several catalysts, (5) comparison of high and low conversion runs in the BF3-catalyzed oligomerization of 1-decene, and (6) screening synthetic procedures for preparing tetrasubstituted methanes having three equal groups and a methyl group. Author (GRA)

N82-21343# Utah Univ., Salt Lake City. Dept. of Mechanical and Industrial Engineering.
CRACK VELOCITY MEASUREMENTS IN SOLITHANE 113 Annual Technical Report, Jan. - Dec. 1980
S. R. Swanson 12 Jan. 1982 35 p refs
(Contract N00014-80-C-0156)
(AD-A110010; UTEC-ME-82-004) Avail: NTIS HC A03/MF A01 CSCL 20/11

An experimental study of crack propagation speeds in a highly viscoelastic polymer, Solithane 113, is presented in this report. Loadings were applied to precracked sheet specimens over a wide range of rates. Resulting crack speed were found to vary from .003 to 1600 in/sec (.00008 to 40 m/s). The primary purpose of this study was to investigate the transition from quasistatic to dynamic crack propagation in viscoelastic materials. It is believed that this transition depends strongly on the viscoelastic material properties. These properties vary widely with time for strongly viscoelastic materials such as Solithane 113 in the modulus transition range above the glass transition temperature. The results showed that the crack speed varied with stress intensity factor raised to a power of 6, in good agreement with previous studies for this material. GRA

N82-21344# Mechanical Technology, Inc., Annapolis, Md. Applications Engineering Dept.
PRECISION MEASUREMENT OF GEAR LUBRICANT LOAD-CARRYING CAPACITY (FEASBILITY STUDY) Final Report, 1 Sep. 1980 - 1 Aug. 1981
N. Suresh Rao, Alan Maciejewski, and Peter B. Senholzi Wright-Patterson AFB, Ohio AFWAL Nov. 1981 154 p refs
(Contract F33615-80-C-2016; AF Proj. 3048)
(AD-A110289; MTI/WDC-81TR11; AFWAL-TR-81-2107) Avail: NTIS HC A08/MF A01 CSCL 11/8

The imprecision problem exhibibited by the Ryder Gear Test (ASTM D-1947) utilized as a gear lubricant load-carrying capacity qualification test was evaluated. The feasibility of developing a precision technique for measuring gear lubricant load-carrying capacity suitable to replace the current costly and imprecise Ryder Gear Test was considered. The revised criteria proposed involves a three step characterization process which includes wear, scoring load, and post scoring recovery time. This criteria will be implemented through a real time monitoring approach. The proposed precision load-carrying capacity test device is a disc on disc approach. Critical precision parameters include continuous loading, test specimen cooling, precision control of specimen quality, and precision control of operating parameters.

Utilization of the new criteria in conjunction with the advanced disc on disc machine will provide a cost effective, precision determination of gear lubricant load-carrying capacity. Primary program recommendations include the design, fabrication, and testing of the proposed new test approach. GRA

N82-21345*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
EVALUATION OF THE EFFECTS OF A FREEZE/THAW ENVIRONMENT ON CELLULAR GLASS
P. Frickland, E. Cleland, and T. Hasegawa 15 Aug. 1981 41 p refs
(Contract DE-AT04-81AL-16228)
(NASA-CR-168719; DOE/JPL-1060-44; NAS 1.26:168719; DE81-03093) Avail: NTIS HC A03/MF A01 CSCL 11B

Cellular glass technology with respect to solar energy applications was briefly reviewed and current applications and related studies are discussed. Using the evaluation criteria of water vapor permeability and conformability, a protective butyl rubber/silicone conformal coating system was selected for use on Foamglas substrates in a freeze/thaw environment. The selection of a specific freeze/thaw cycle which closely models field conditions is discussed. A sampling plan is described which allows independent evaluation of the effects of conformal coatings, cycle number and location within the environmental chamber. The results of visual examination, measurement of density, modulus of rupture and Young's modulus are reported. Based upon statistical evaluation of the experimental results, it is concluded that no degradation in mechanical properties of either coated or uncoated Foamglas occurred within the duration of the test (53 freeze/thaw cycles). T.M.

N82-21346# Royal Aircraft Establishment, Farnborough (England).
ABRASION AND HYDROSTATIC HEAD OF WEATHERED RUBBER-COATED FABRICS
J. E. Swallow and A. R. Wakefield (Quality Assurance Directorate, Chorley, Engl.) London HMSO Oct. 1980 33 p refs
(RAE-TR-80124; MOAD-306; RAE-MAT-411; BR77046) Avail: NTIS HC A03/MF A01

The abrasion mass loss and hydrostatic head of a nylon and of a cotton fabric, each coated with natural rubber, neoprene, polyurethane (PU) or chlorosulfonated polyethylene (CSPE) and exposed to various weathering conditions, were determined. A Martindale abrasion tester was used. Correlations between hydrostatic head and abrasion mass loss are generally low. During abrasion, coated nylon fabrics lose more mass than coated cotton fabrics. Most susceptible to abrasion is CSPE particularly on nylon though with little dependence on conditions of exposure. Neoprene is worse on cotton. PU has the lowest mass loss and least susceptibility to exposure conditions, except at a hot, wet jungle site. Natural rubber lost more mass on abrasion than neoprene or PU, especially at a site in England. Load during exposure has a negligible effect. Author (ESA)

N82-21347# Centre echnique des Industries Mecaniques, St. Etienne (France).
COMPARATIVE STUDY OF SPECIFICATIONS AND PROJECTS FOR SPECIFICATIONS REGARDING LUBRICANTS FOR RECIPROCATING AIR COMPRESSORS Final Report [ETUDE COMPAREE DES SPECIFICATIONS ET PROJETS DE SPECIFICATIONS DES LUBRIFIANTS POUR COMPRESSEURS D'AIR ALTERNATIFS]
Nicole Ollier and Michel Ganier Mar. 1981 40 p Partly in FRENCH and ENGLISH Supersedes CETIM-N.2X.00.0 of December 1980
(CETIM-N-2X-00-0) Avail: NTIS HC A03/MF A01

Documents which classify or specify lubricants for air compressors are reviewed, emphasizing comparison with German norms currently in effect. The norm DIN 51506 (Jul. 1977) is cited. An ISO classification project is outlined as well as the ISO specification project for reciprocating air compressor lubricants. It is noted that ISO specifications tend to be less severe than the corresponding DIN specifications. Author (ESA)

N82-21348# Bekaert (N.V.) S.A., Zwevegem (Belgium). Research and Development Dept.
HARMFUL EFFECT OF WATER ON THE ADHESION OF STEEL CORD TO RUBBER IN TIRES
W. Coppens Feb. 1981 24 p refs
(Rept-03355/1/81) Avail: NTIS HC A02/MF A01

The detrimental effect of sulidation during both tire manufacture and use is shown. In use, adhesion is affected by water diffusion through the rubber and by direct attack of the interface layer through cuts. Suggested countermeasures are: the adaption of both physical and chemical composition of the rubber, the use of an inner liner with minimum moisture permeability, and the use of cords with low reactivity, such as those with low-copper brass coatings. Author (ESA)

N82-21349# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium). Plastiques Section.
INDUSTRIAL BEHAVIOR OF POLYMER ALLOYS: ANALYSIS AND OUTLOOK [COMPORTEMENT INDUSTRIEL DES ALLIAGES POLYMERIQUES: ANALYSE ET PERSPECTIVES NOUVELLES]
Henri Frederix, Roger Fayt, and Albert Gilliquet Jul. 1981 102 p refs In FRENCH Sponsored by Inst. pour l'Encouragement de la Recherche Scientifique dans l'Industrie et l'Agriculture Original contains color illustrations
(CRIF-PL-15) Avail: NTIS HC A06/MF A01

The effect of standard injection techniques on the mechanical properties of polymer alloys was investigated in order to improve the compatibility of constituent polymers. Laboratory tests (morphological, rheological) on PVC, PE and PS based mixes are reported. Polymer alloys respond to injection techniques in the same way as simple polymers. Alloys containing > 50% PVC are too fluid to maintain set diameters; pipe alloys containing > 60% PVC or PS rupture during tests. The most critical parameters when developing alloys are phase dispersion control and adhesion between phases. Author (ESA)

N82-21350# Environmental Protection Agency, Ann Arbor, Mich. Test and Evaluation Branch.
TESTING OF 6 ENGINE OILS IN ACCORDANCE WITH THE EPA RECOMMENDED PRACTICE FOR TESTING, GRADING AND LABELING THE FUEL EFFICIENCY OF MOTOR VEHICLE ENGINE OILS
F. Peter Hutchins and Thomas J. Penninga May 1981 97 p
(PB81-244980; EPA-AA-TEB-81-16) Avail: NTIS HC A05/MF A01 CSCL 07H

In January/February 1980, the EPA assembled the 'EPA Recommended Practice for Evaluating, Grading and Labeling the Fuel Efficiency of Motor Vehicle Engine Oils'. This procedure used the ASTM approach for carryover oils and incorporated four fuel economy grades for engine oils as well as a label for identification. In March 1980, the EPA initiated a testing program in accordance with the EPA recommended procedure, using two sets of test vehicles to evaluate the feasibility of the procedure. The results of that testing are covered. GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power*, *20 Spacecraft Propulsion and Power*, and *44 Energy Production and Conversion*.

N82-21351 Applied Physics Lab., Johns Hopkins Univ., Laurel, Md. Chemical Propulsion Information Agency.
THE 18TH JANNAF COMBUSTION MEETING, VOLUME 2
Debra Sue Eggleston, ed. Oct. 1981 471 p refs Meeting held at Pasadena, Calif., 19-23 Oct. 1981 4 Vol.
(Contract N00024-81-C-5301)
(AD-A111248; CPIA-Pub-347-Vol-2) Avail: NTIS HC A20 CSCL 21/9

Studies of the combustion of gun and nitramine propellants and combustion with chemical lasers are summarized. The major topics reviewed include: burn rate measurements; gun propellant characterization; transient burning of propellants; gun charge design methodology; nitramine ignition and combustion; and solid

oxidizers and fuels for chemical lasers. For individual titles, see N82-21352 through N82-21377.

N82-21352 Ballistic Research Labs., Aberdeen Proving Ground, Md.
IGNITER EFFECTS ON M6 CLOSED BOMB BURNING RATES
A. A. Juhasz and I. W. May *In* APL The 18th JANNAF Combust. Meeting, Vol. 2 Oct. 1981 p 1-12 refs (For primary document see N82-21351 12-28)
Avail: NTIS HC A20 CSCL 21/9

Closed Bomb burning rates of an MS formulation were determined as a function of igniter type, amount, and charge configuration. Centrally located ignition and good ullage distribution produce smooth burning rate curves even at low pressures. Unusual, augmented low pressure burning rates could be obtained from poorly ignited systems. Chamber oscillations alone are insufficient to explain these effects. The cause may involve a delayed gas-phase reaction of the initial propellant pyrolysis products paralleling normal propellant burning to pressures as high as 20 MPa. Author

N82-21353 Ballistic Research Labs., Aberdeen Proving Ground, Md.
WIDE TEMPERATURE RANGE BURNING RATE STUDIES OF M30A1 PROPELLANT
A. A. Juhasz, J. O. Doali, and R. E. Bowman *In* APL The 18th JANNAF Combust. Meeting, Vol. 2 Oct. 1981 p 13-23 refs (For primary document see N82-21351 12-28)
Avail: NTIS HC A20 CSCL 21/9

A series of experiments aimed at obtaining burning rate sensitivity data for M30A1 propellant were conducted from -50 C to +95 C. Reasonable data were obtained to 85 C. Between -50 and +65 C the experimental data could be matched closely using a theoretically based burning rate-temperature sensitivity relationship. At higher temperatures the burning rates appeared to change more rapidly with temperature than predicted by the equation. This may be due to changes in the heat balance at the burning surface due to the effects of high tempratures and pressures. Author

N82-21354 Ballistic Research Labs., Aberdeen Proving Ground, Md.
A SIMPLE THEORETICAL ANALYSIS AND EXPERIMENTAL INVESTIGATION OF BURNING PROCESSES FOR STICK PROPELLANT
F. W. Robbins and A. W. Horst *In* APL The 18th JANNAF Combust. Meeting, Vol. 2 Oct. 1981 p 25-34 refs (For primary document see N82-21351 12-28)
Avail: NTIS HC A20 CSCL 21/9

The interior ballistic performance of propelling charges employing perforated, unslotted stick propellant often cannot be simulated using either lumped-parameter or two-phase flow models without altering input data beyond realistic limits. A lumped-parameter model was modified to account for enhanced burning within the perforations of stick propellant, a consequence of higher local pressures accompanying the choking of product gases exiting the perforations. A further extension allowed treatment of additonal surface area exposed should grain fracture occur as a result of excessive internal pressures. Results obtained using the modified code are compared to 155 mm howitzer firings. Data from closed-bomb firings which demonstrate the same effect are also included. Author

N82-21355 Princeton Combustion Research Labs., Inc., N.J.
DYNAMIC PRESSURE GENERATING SYSTEM FOR CALIBRATING COPPER CRUSHER PRESSURE GAGES
N. A. Messina, L. S. Ingram, and M. Summerfield *In* APL The 18th JANNAF Combust. Meeting, Vol. 2 Oct. 1981 p 35-44 refs (For primary document see N82-21351 12-28)
(Contract DAAK11-79-C-0029)
Avail: NTIS HC A20 CSCL 21/9

Measurement of the pressures that develop in weapons during firing tests were made to provide important data for use in the design and performance analysis of propellants, projectiles, and ignition systems. The copper crusher pressure gage, a relatively simple and economical, yet effective, device was used for measuring peak pressure. The basic components of the crusher gage are a cylinder, piston, anvil, and a solid copper sphere called a 'crusher'. When the gage is subjected to pressure, the crusher is pressed between the piston and anvil and deforms. It was this degree of deformation which was calibrated as a function of pressure loading. Author

N82-21356 Ballistic Research Labs., Aberdeen Proving Ground, Md.
WORKSHOP REPORT: COMBUSTION OF VERY HIGH BURNING RATE (VHBR) PROPELLANTS
Robert A. Fifer *In* APL The 18th JANNAF Combust. Meeting, Vol. 2 Oct. 1981 p 45-53 refs (For primary document see N82-21351 12-28)
Avail: NTIS HC A20 CSCL 21/9

Results of studies dealing with the combustion behavior of certain materials which by virtue of their very high apparent burning rates are considered for certain specialized application requiring large flame propagation-or gas generation-rates are summarized. An assessment of the current state of knowledge of the combustion characteristics of VHBR materials was made. VHBR materials were defined as those with apparent burning rates that are roughly in the 1-100 m/s range, i.e., intermediate in magnitude between that for normal burning and detonation. By examining available burn rate data users would be able to assess the possible combustion mechanisms (e.g., laminar, convective, fracture augmented, etc.) of VHBR materials, and to establish what chemical and physical properties (e.g., chemical composition, porosity, mechanical strength, etc.) determine the apparent burning rates of these materials. A secondary concern, safety related, is also discussed. M.D.K.

N82-21357 Geo-Centers, Inc., Newton, Mass.
LASER IGNITION CHARACTERISTICS OF M-26 SUN PROPELLANT
P. P. Ostrowski, J. F. Grant, and D. S. Downs (Army Aviation Research and Development Command, Dover, N.J.) *In* APL The 18th JANNAF Combust. Meeting, Vol. 2 Oct. 1981 p 55-61 refs (For primary document see N82-21351 12-28)
(Contract DNA001-79-C-0208)
Avail: NTIS HC A20 CSCL 21/9

The ignition characteristics of M-26 gun propellant exposed to pulsed ruby laser energy were investigated. The tests revealed a lower ignition boundary of 10 J/sq cm for reliable ignition of M-26 for laser beam diameters less than 3 mm. No upper ignition boundary could be determined. Also, M-26 was successfully ignited through a 600 micrometers glass fiber at 484 J/sq cm. These results show that direct, multiple point ignition of M-26 through fiber optic bundles is both feasible and practical, and can be accomplished with lasers of less than 1 joule total energy. Additional experiments demonstrated that the laser ignition of M-26 is controlled by the graphite in the formulation, as M-26 without graphite could not be ignited. Author

N82-21358 Ballistic Research Labs., Aberdeen Proving Ground, Md.
THRUST CHARACTERIZATION OF VERY HIGH BURNING RATE PROPELLANTS
I. W. May, F. R. Lynn, A. A. Juhasz, E. Fisher (Calspan Corp., Buffalo, N.Y.), and P. S. Gough (Gough (Paul) Associates, Inc.) *In* APL The 18th JANNAF Combust. Meeting, Vol. 2 Oct. 1981 p 95-105 refs (For primary document see N82-21351 12-28)
(Contract DAAK11-77-C-0035)
Avail: NTIS HC A20 CSCL 21/9

A series of closed bomb combustion tests were conducted on several very high burning rate (VHBR) propellants in which, in addition to the standard pressure measurements, the thrust produced by a burning propellant column was measured using a dynamic force gage located at the end of the propellant column. The results indicate that in several instances the total force imparted to the force gage substantially exceeded that due to the gas pressure alone. The difference is ascribed to the thrust or impulse resulting from very high apparent burning rates. In fact, an analysis of the data for two VHBR propellants indicates that effective burning rates from 100 to 300 m/s are required to produce the observed thrust levels. Such burning rates are not explainable by conventional combustion models. Additional physical processes such as convective flamespread or

stress-induced surface fracture must be invoked to explain such high apparent burning rates. M.D.K.

N82-21359 Ballistic Research Labs., Aberdeen Proving Ground, Md.

THE THERMODYNAMICS OF VHBR PROPELLANTS

Eli Freedman *In* APL The 18th JANNAF Combust. Meeting, Vol. 2 Oct. 1981 p 107-114 refs (For primary document see N82-21351 12-28)

Avail: NTIS HC A20 CSCL 21/9

A class of very high burning rate propellants containing one or another proprietary boron compounds was proposed and compounded. Samples of these compositions were fired in closed bombs by the contractor and by the Ballistic Research Laboratory. The maximum pressures thus obtained compared with pressures computed thermodynamically. The latter were considerably greater. The probable explantation is the complex nature of the combustion process. Computed heats of explosion were in good agreement with the measured values. Author

N82-21360 Ballistic Research Labs., Aberdeen Proving Ground, Md.

SIMULATION OF CLOSED CHAMBER BURNING OF VERY-HIGH BURNING RATE PROPELLANT

Paul G. Baer *In* APL The 18th JANNAF Combust. Meeting, Vol. 2 Oct. 1981 p 115-125 refs (For primary document see N82-21351 12-28)

Avail: NTIS HC A20 CSCL 21/9

Closed chamber firings of very-high burning rate (VHBR) propellants were conducted as part of a traveling charge gun program. Using standard closed chamber data reduction techniques, burning rates in the range of 10 to 300 m/s over a pressure range of 50 to 300 MPa were measured. Pressure-time records from the firings of VHBR propellants exhibited severe pressure wave phenomena which were removed by digital filtering prior to transformation to burning rate data. Burning rate data for four VHBR propellants were used in a 1-D traveling charge code set up to simulate VHBR propellant being fired in a closed chamber. Objectives were to check consistency of the data, obtain better estimates of the data, obtain an understanding of the gas dynamic phenomena occurring in the chamber, and assess the validity of simulations produced by the 1-D traveling charge gun code. Author

N82-21361 Naval Ordnance Station, Indian Head, Md.

AN ATTEMPT TO INDEPENDENTLY SUBSTANTIATE DYNAMIC BURNING RATES

C. G. Irish, Jr. *In* APL The 18th JANNAF Combust. Meeting, VOL. 2 Oct. 1981 p 139-147 refs (For primary document see N82-21351 12-28)

Avail: NTIS HC A20 CSCL 21/9

Very significantly enhanced burning rates were found for seven propellants in ballistic compressor experiments conducted at pressurization rates of 700 MPa/ms (100 kpsi/ms). Two of these propellants were subjected to chamber pressurization rates approaching (60%) or equaling those of the experiments in one or two gun systems with no substantiation or refutation of the dynamic rates, only constraints on the conditions under which they might occur. The major conclusion, based upon Occam's razor and the history of small arms ammunition, is that the enhanced rates are only apparent. Author

N82-21362 Ballistic Research Labs., Aberdeen Proving Ground, Md.

FITTING TRANSIENT COMBUSTION MODELS TO ONERA DATA

C. W. Nelson *In* APL The 18th JANNAF Combust. Meeting, Vol. 2 Oct. 1981 p 149-156 refs (For primary document see N82-21351 12-28)

Avail: NTIS HC A20 CSCL 21/9

Combustion experiments at ONERA (France) under pressurization conditions at 20-40 atm measured transient regression rates of 3-4 times the quasi-steady rate for composite propellants. Since these experiments represent the practically sole measurement in positive pressurization conditions, they provide one of the few opportunities to validate transient combustion modeling. Given the experimental pressure-time history, and the ONERA propellant data, variations were made in the feedback sub-model of thermal theory models (Kooker, Zeldovich) and in selected constants in an attempt to reproduce the ONERA regression rate results. The Zeldovich approach failed to reproduce the magnitude of the excursions in regression rate. Activation energy is the only free parameter in that scheme once all the thermophysical constants are set independently. The Kooker model responded peculiarly. It has two free parameters: activation energy and heat feedback from the surface heat release (H). For activation energy < 30 and $H < 0.7$, the excursion did not exceed 30%. At high activation energy and high H, it far exceeded the experimental excursions. The peculiarity is its tendency to make a sharp transition from low to high excursions. Author

N82-21363 Maryland Univ. Baltimore County, Catonsville. Dept. of Physics.

TRANSITION FROM CONDUCTIVE TO CONVECTIVE HEAT TRANSFER IN FLUID-FILLED POROUS MATERIALS

A. A. Campolattaro (Naval Surface Weapons Center, White Oak, Md.) and G. R. Laib *In* APL The 18th JANNAF Combust. Meeting, Vol. 2 Oct. 1981 p 157-175 refs (For primary document see N82-21351 12-28)

Avail: NTIS HC A20 CSCL 21/9

The heat transfer mechanism for an infinite, horizontal, fluid-saturated, homogeneous porous slab is analyzed by assuming the validity of Darcy's law. By perturbing the equilibrium configuration, it is shown that there exists a stability condition for the temperature gradient beta such that for beta $<$ 4 pu sq kappa/K alpha h sq (where kappa is the thermal diffusivity, K is the permeability, h is the thickness through which the thermal gradient is established, and alpha is the bulk thermal expansion coefficient of the fluid), the mechanism of heat transfer changes from conductive to primarily convective. The role of this stability criterion in Deflagration to Detonation Transition of porous explosives and propellants is discussed. Author

N82-21364 Ballistic Research Labs., Aberdeen Proving Ground, Md.

A MECHANISM FOR THE BURNING RATE OF HIGH DENSITY, POROUS AND ENERGETIC MATERIALS

D. E. Kooker and R. D. Anderson *In* APL The 18th JANNAF Combust. Meeting, Vol. 2 Oct. 1981 p 177-192 refs (For primary document see N82-21351 12-28)

Avail: NTIS HC A20 CSCL 21/9

A mechanism is proposed to explain how the deflagration of a confined, thermally ignited column of high density, compacted, granular, energetic material accelerates from a surface burning process. A mathematical model for the porous equation of state is derived and the results compared with a compaction wave experiment. A first generation combustion model is derived and numerical solution difficulties are discussed. Author

N82-21365 Ballistic Research Labs., Aberdeen Proving Ground, Md.

SOME COMBUSTION AND FLAMESPREAD CHARACTERISTICS OF BLACK POWDER

K. J. White and R. A. Sasse *In* APL The 18th JANNAF Combust. Meeting, Vol. 2 Oct. 1981 p 243-268 refs (For primary document see N82-21351 12-28)

Avail: NTIS HC A20 CSCL 21/9

Flame spread characteristics of black powder were studied. It was found that the flame spread velocity depends on the specific lot of black powder and also depends strongly on grain size. As the grain size decreases, the velocity increases and reaches a maximum value. Thereafter a decrease in particle size causes a decrease in velocity. It was also found that flame spread rate is very geometry-dependent and at low pressures, rapid grain-to-grain propagation requires a specific geometrical configuration. This is caused by the specific way in which a grain burns. Examination of closed chamber results and flame spread measurements in primer tubes indicates that grain breakup or deconsolidation may take place under conditions of vigorous ignition. It is suggested that mechanical properties may affect the ballistic performance of black powder. Evidence is also presented to show that the manufacturing process of black powder can affect the mechanical properties and, hence, the ballistic performance. Windowed combustor measurements yield a low pressure exponent (0.164) for the burn rate of black powder at pressures greater than 0.3 MPa. At pressures up to

13 MPa there is no evidence of combustion induced deconsolidation. Author

N82-21366 Army Armament Research and Development Command, Dover, N. J. Large Caliber Weapon Systems Lab.
CONTINUING DEVELOPMENT OF A SOLVENT PROCESSED INSENSITIVE PROPELLANT
R. Trask, B. Strauss, E. Costa, and A. J. Beardell *In* APL The 18th JANNAF Combustion Meeting, Vol. 2 Oct. 1981 p 291-304 refs (For primary document see N82-21351 12-28)
Avail: NTIS HC A20 CSCL 21/9

Improvement of a low vulnerability formulation containing 73.5% RDX, 11.7% ethyl cellulose, 7.4% NC (12.6% N), and 7.4% inert plasticizer (dibutyl phthalate) which results in a force of 1090 Joules/g and an isochoric flame temperature of 2600 K is described. This composition was subjected to limited ballistic firing, hazards analysis, and laboratory and vulnerability tests. The 7.4% NC was incorporated to increase burning rate and impetus, although compromising vulnerability slightly. The inert plasticizer was replaced by triacetin and by acetyl triethyl citrate. Other cellulosic binders evaluated were cellulose acetate propionate and cellulose acetate butyrate. The effect of dual nitramine oxidizers, RDX/HMX, is reported. An aging program for insensitive propellant candidates is discussed and preliminary data presented. J.D.H.

N82-21367 Ballistic Research Labs., Aberdeen Proving Ground, Md.
BINDER REQUIREMENTS FOR LOW VULNERABILITY PROPELLANTS
S. Wise and J. J. Rocchio *In* APL The 18th JANNAF Combust. Meeting, Vol. 2 Oct. 1981 p 305-320 refs (For primary document see N82-21351 12-28)
Avail: NTIS HC A20 CSCL 21/9

A review of nitramine-inert binder gun propellant technology, as it applies to Low Vulnerability (LOVA) propellants, is presented. Particular emphasis is placed on the effect the binder has on their performance, vulnerability, and producibility. To achieve the desired performance, the binder should have a significant amount of oxygen. For vulnerability reasons, it should endothermically decompose between 200 to 350 C under acid catalysis and when loaded with 75-80% solids, should be a tough rubbery material. To simplify the production of these propellants, the binder should be reversibly processable. This information is summarized in a flow chart which provides general guidelines for the design, testing, and evaluation of low vulnerability composite nitramine propellants. Author

N82-21368 Ballistic Research Labs., Aberdeen Proving Ground, Md.
THE HOT FRAGMENT CONDUCTIVE IGNITION TEST: A MEANS OF EVALUATING PROPELLANT VULNERABILITY TO SPALL
H. C. Law and J. J. Rocchio *In* APL The 18th JANNAF Combust. Meeting, Vol. 2 Oct. 1981 p 321-334 refs (For primary document see N82-21351 12-28)
Avail: NTIS HC A20 CSCL 21/9

The hot fragment conductive ignition test is described including the physical apparatus and procedures for operation. Ignition data are presented for a number of nitramine and nitrate ester propellants and are compared with shaped charge jet spall and controlled fragment impact ignition field test data. Experience with the test has yielded results that correlated well with field tests thus providing a good laboratory method of evaluating propellant vulnerability to spall. The theory of operation of the laboratory test and some aspects of the ignition process are discussed as well as plans for future improvements of the test. Author

N82-21369 Cohen (Norman) Professional Services, Redlands, Calif.
SIMPLIFICATIONS AND VARIATIONS OF THE BEN REUVEN-CAVENY MODEL OF HMX COMBUSTION
Norman S. Cohen, George A. Lo, and Joseph C. Crowley *In* APL The 18th JANNAF Combust. Meeting, Vol. 2 Oct. 1981 p 361-371 refs (For primary document see N82-21351 12-28)
Avail: NTIS HC A20 CSCL 21/9

Approximations of a comprehensive model of HMX combustion are made in order to avoid numerical integration of the governing differential equations and to calculate burning rates. Results are discussed for several laws determinative of the surface temperature and for an endothermic as well as exothermic mechanism for liquid phase decomposition. It is concluded that nearly all of the HMX decomposition occurs in the vapor phase and that the combustion is driven by exothermic vapor phase decomposition. This model predicts the burn rate, exponent, and temperature sensitivity of HMX quite well. It is found that accelerating the liquid phase decomposition would bring about a decrease in the burn rate because more liquid phase decomposition would occur at the expense of the more energetic vapor phase decomposition. Therefore, it appears necessary to catalyze the gas phase processes in order to increase the burning rate of HMX. Author

N82-21370 Ballistic Research Labs., Aberdeen Proving Ground, Md.
NUMERICAL RELIABILITY OF SOLID MONOPROPELLANT COMBUSTION MODELS
Martin S. Miller and Terence P. Coffee *In* APL The 18th JANNAF Combust. Meeting, Vol. 2 Oct. 1981 p 373-382 refs (For primary document see N82-21351 12-28)
Avail: NTIS HC A20 CSCL 21/9

Solid monopropellant combustion is commonly idealized as a single surface pyrolysis reaction which creates the treatments for a single exothermic gas reaction. Using Arrhenius forms for both reaction rate coefficients results in nonlinear conservation equations for which exact solutions do not exist. A number of previous models have employed analytic or partially analytic solutions as an approximation. This paper examines the numerical accuracy of these approximate solutions by comparison with numerical solutions of the same equations. It is concluded that no model algorithm is generally reliable but some are rasonably accurate for certain combinations of kinetics parameters. Author

N82-21371 Naval Weapons Center, China Lake, Calif.
THE THERMAL DECOMPOSITION OF HMX: EFFECT OF EXPERIMENTAL CONDITIONS AND OF ADDITIVES
K. J. Kraeutle *In* APL The 18th JANNAF Combust. Meeting, Vol. 2 Oct. 1981 p 383-394 refs (For primary document see N82-21351 12-28)
(SR2402002)
Avail: NTIS HC A20 CSCL 21/9

The decomposition of cyclotetramethylenetetranitramine (HMX) was studied by isothermal and nonisothermal methods. Weight loss measurements were made under isothermal conditions in 93 kPa of air, oxygen, and nitrogen. Different kinetic parameters were obtained for the reaction in the three gases. The liquefaction of HMX was found to be highly temperature sensitive and to depend on sample characteristics and experimental conditions. Combustion tests showed that differential thermal analysis is not a reliable method to screen potential burn rate modifiers of HMX. Author

N82-21372 Ballistic Research Labs., Aberdeen Proving Ground, Md.
CRITICAL ANALYSIS OF NITRAMINE DECOMPOSITION ON DATA PRODUCT DISTRIBUTIONS FROM HMX AND RDX DECOMPOSITION
Michael A. Schroeder *In* APL The 18th JANNAF Combust. Meeting, Vol. 2 Oct. 1981 p 395-414 refs (For primary document see N82-21351 12-28)
Avail: NTIS HC A20 CSCL 21/9

A brief summary of a literature review on product distributions from HMX and RDX decomposition is presented. A discussion of the first step of the decomposition is presented. The N2/N2O ratio and some possible mechanisms for formation of molecular nitrogen (N2) are discussed. It is suggested that further isotope labelling studies of the type mentioned above would also contribute to our understanding of the followup processes initial HMX and RDX decomposition. It is pointed out that possibly the most useful aspect of thermal decomposition studies at low temperatures and pressures is to elucidate the types of chemical decomposition processes involved, including minor (at low temperatures and pressures) pathways in addition to the principal ones. N.W.

N82-21373 Ballistic Research Labs., Aberdeen Proving Ground, Md.
COMPETING REACTION PATHWAYS FOR FLAME RADICALS
George F. Adams *In* APL The 18th JANNAF Combust. Meeting, Vol. 2 Oct. 1981 p 415-422 refs (For primary document see N82-21351 12-28)
Avail: NTIS HC A20 CSCL 21/9

The results of molecular modeling studies of competitive reaction pathways involving the flame radicals methoxy, CH_3O, and hydroxmethylene, CH_2OH are described. The approach described can, in principle, be applied to the study of competitive decomposition pathways in any molecule. N.W.

N82-21374 Ballistic Research Labs., Aberdeen Proving Ground, Md.
CONVECTIVE IGNITION OF DOUBLE-BASED PROPELLANTS
A. Cohen and H. E. Holmes *In* APL The 18th JANNAF Combust. Meeting, Vol. 2 Oct. 1981 p 423-431 refs (For primary document see N82-21351 12-28)
Avail: NTIS HC A20 CSCL 21/9

Convective heating of propellant powders by means of a reflected shock technique was greater than 750 k used to study particle ignition. The method depends on measuring transient emission from shock heat powders. At reflected shock temperature the experimental data for nitrocellulose (NC) powder which passed through a 20 micron sieve, indicate that initial emission came from particle with diameter less than 5 micron. The initial results of experiments with M-9 propellant indicated that ignition delays were similar to those neat NC. This suggested that under convective heating conditions in the shock tube and perhaps in general, ignition is controlled by reaction of NC. Shock tube experiments were performed on neat nitroglycerin (NG) and three types of plasticized polymers made from cellulose acetate (CA) + NG, NC + triacetin (TA), and NC + NG. N.W.

N82-21375 Rocketdyne, Canoga Park, Calif.
HIGH YIELD NITROGEN GENERATORS
G. D. Artz and J. E. Flanagan *In* APL The 18th JANNAF Combust. Meeting, Vol. 2 Oct. 1981 p 433-438 refs (For primary document see N82-21351 12-28)
Avail: NTIS HC A20 CSCL 21/9

Solid reactant nitrogen generator formulations, which yield less than 50 weight percent nitrogen, were developed and evaluated in small-scale tests. These formulations, based upon sodium azide as the primary nitrogen source, have been pressed into cylindrical pellets with excellent physical properties. Theoretical thermochemical calculations were performed to optimize nitrogen yields and combustion temperatures. Experimental verification of the predicted performance was accomplished on several formulations. N.W.

N82-21376 Michigan Univ., Ann Arbor.
THE BOUNDARY LAYER STRUCTURE OF A BURNING FUEL CLOUD
M. Sichel and S. J. Correa *In* APL The 18th JANNAF Combust. Meeting, Vol. 2 Oct. 1981 p 439-451 refs (For primary document see N82-21351 12-28)
Avail: NTIS HC A20 CSCL 21/9

The relative probabilities of single-drop and group combustion in a typical fuel cloud are examined. A non-dimensional parameter based on the initial cloud and drop radii and the drop number density is used in an asymptotic theory for the cloud behavior. A vaporization wave located at the cloud edge is shown to propagate into the saturated, non-vaporizing interior. N.W.

N82-21377 California Univ., Berkeley. Lawrence Berkeley Lab.
ANALYSIS OF TRANSIENT, EROSIVE FLOWS
Sang-Wook Kang *In* APL The 18th JANNAF Combust. Meeting, Vol. 2 Oct. 1981 p 453-455 Sponsored in part by Army Armament Research and Development Command (For primary document see N82-21351 12-28)
(Contract W-7405-eng-48)
Avail: NTIS HC A20 CSCL 21/9

Theoretical analysis is made of surface heating history when a surface is exposed to transient thermal fluxes from a turbulent compressible boundary layer. The conservation equations are solved by means of a factored ADI method. Results display high heat fluxes at the surface, causing sufficient rise in surface temperature to quickly reach melting in some substance. The melting liquid-layer case in also briefly discussed. Author

N82-21378 Applied Physics Lab., Johns Hopkins Univ., Laurel, Md. Chemical Propulsion Information Agency.
THE 18TH JANNAF COMBUSTION MEETING, VOLUME 3
Debra Sue Eggleston Oct. 1981 455 p refs Proc. of Conf. held at Pasadena, Calif., 19-23 Oct. 1981 4 Vol.
(Contract N00024-81-C-5301)
(AD-A111249; CPIA-Pub-347-Vol-3) Avail: NTIS HC A20 CSCL 21/9

A summation of studies on the combustion of solid rocket propellants and on combustion within ramjets is presented. Areas of interest which are discussed include: acoustic and flow measurements; analysis of response functions; nonlinear instability; metal combustion; instrumentation and motor behavior; aging and ignition; pressure oscillations in small ramjets and solid fuel ramjets; and steady state combustion. For individual titles, see N82-21379 through N82-21413.

N82-21379 Georgia Inst. of Tech., Atlanta.
ROCKET MOTOR AEROACOUSTICS
Warren C. Strahle and Uday M. Hegde *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 1-7 refs (For primary document see N82-21378 12-28)
(Contract FA9620-78-C-0003)
Avail: NTIS HC A20 CSCL 21/9

Pressure fluctuations inside of a rocket motor cavity, one source of vibrations, were investigated. The broad band random pressure fluctuations normally considered reasonable to tolerate are of the order of 1% rms magnitude when compared with the mean chamber pressure. Depending upon the frequency content of this background, however, this 1% level can cause vibration troubles. Two experimental configurations were used to study this problem. One was a long pipe, 5 cm in diameter, which was terminated by a choked nozzle. The purpose was to create a fully developed pipe flow turbulent field through the majority of the pipe. The second configuration was a rocket motor simulator, where the porous walls allow mass flow through the sides, and the head end was closed. The primary issue was whether or not the pressure fluctuations induced by the interior turbulent flows was predictable. The theoretical approach which was followed was through the Bernoulli enthalpyy formalism of aeroacoustics. M.D.K.

N82-21380 Jet Propulsion Lab., California Inst. of Tech., Pasadena.
EFFECTS OF AP SIZE DISTRIBUTION ON THE PRESSURE-COUPLED RESPONSE FUNCTION
Norman S. Cohen (Cohen Professional Service, Inc.) and Leon D. Strand *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 7-20 refs (For primary document see N82-21378 12-28)
(AFOSR ISSA 81-00019)
Avail: NTIS HC A20 CSCL 21/9

Progress in theoretical and experimental research to determine effects of AP size distribution on the pressure-coupled response function is presented. The theoretical model was based upon a preferred frequency mechanism in which ordered fluctuations in the propellant formulation, dependent upon the heterogeneity, contributed to the response. Experiments to charaterize and relate the heterogeneity to response function behavior consisted of scanning electron microscope studies and measurements of dynamic burning at constant pressure. The concept, differences between ideal models and real propellants, and results thus far obtained are discussed. Author

N82-21381 Atlantic Research Corp., Alexandria, Va
EXAMINATION OF ALTERNATE APPROACHES FOR UTILIZING STEADY-STATE PROPELLANT COMBUSTION MODEL PARAMETERS IN CALCULATION OF PRESSURE-COUPLED RESPONSE FUNCTIONS
M. K. King *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 21-30 refs (For primary document see N82-21378 12-28)
Avail: NTIS HC A20 CSCL 21/9

Two approaches to coupling equations describing quasi-steady state gas phase combustion processes with a standard analysis of the thermal response of a solid propellant to a sinusoidally-varying heat flux at the surface were examined. Discrepancies between calculated pressure-coupled response functions obtained by imbedding a complex steady-state composition propellant combustion model into two different algorithms for calculation of these functions, one based on the Zeldovich approach and the other relaxing an assumption used in that approach, were resolved. It was concluded that the Zeldovich approach, involving use of an equation relating gas-phase heat feedback perturbations to mass flux and pressure perturbations through steady-state interdependencies of these parameters fails if the surface heat release term is dependent on propellant conditioning temperatures. The alternate phase-shifted-boundary-condition approach did not suffer from these problems. Results of both approaches are presented. M.D.K.

N82-21382 Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
EXPERIMENTAL DETERMINATION OF THE VELOCITY COUPLED RESPONSE OF SOLID PROPELLANTS
B. T. Zinn and Lakshmanan Narayanaswami *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 31-38 refs (For primary document see N82-21378 12-28)
(Grant AF-AFOSR-2571-73)
Avail: NTIS HC A20 CSCL 21/9

The adapation of an impedance tube for the determination of the velocity coupled response of solid propellants is described. The experimental setup consisted of a tube with a disc shaped solid propellant sample at one end and additional propellant samples on the tube's side walls at some distance downstream of the end propellant sample. During an experiment, an acoustic driver located at the opposite end of the tube was utilized to establish a standing wave of a desired frequency within the impedance tube and an array of pressure transducers mounted at preselected locations along the impedance tube walls as used to measure the wave structure within the impedance tube throughout the course of the experiment. The development of a new data reduction procedure that utilized the measured acoustic pressure data and solutions of the impedance tube wave equations to determine the unknown velocity coupled response function is described. The results show that the developed procedure determines the velocity coupled response function with acceptable accuracy in a numerically efficient manner. Author

N82-21383 Air Force Rocket Propulsion Lab., Edwards AFB, Calif.
NONLINEAR VELOCITY COUPLED INSTABILITY IN SOLID ROCKET MOTORS
Jay N. Levine and Joseph D. Baum (Dayton Univ.) *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 39-48 refs (For primary document see N82-21378 12-28)
Avail: NTIS HC A20 CSCL 21/9

The inability of velocity coupling models based on standard quasi-steady gas phase, homogeneous solid phase, assumptions to generate strong nonlinear effects was demonstrated. Further studies to explore the reasons for the failure of such models were conducted. Results that demonstrate the primarily traveling wave nature of nonlinear wave propagation in solid rocket motors, and the complexity of the phase relationships between pressure, burning rate, and velocity oscillations are presented. The effect of a threshold velocity on nonlinear velocity coupled instability was explored, and some of the results are also presented. Author

N82-21384 Aerojet Tactical Systems, Sacramento, Calif.
NONLINEAR STABILITY FOR TACTICAL MOTORS: SUMMARY
M. J. Ditore *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 49-55 refs (For primary document see N82-21378 12-28)
(Contract F04611-81-C-0007)
Avail: NTIS HC A20 CSCL 21/9

An outline and status report for a program to develop pragmatic means of solving nonlinear stability problems evidenced in tactical motors is presented. A detailed description of each of the five phases of the program for studying combustion instability is given. The three major technologies to be developed are discussed along with an outline of accomplishments in each discipline. Characteristics of nonlinear stability are described, and a comparison with linear stability for tactical motors is made. M.D.K.

N82-21385 Aerojet Tactical Systems, Sacramento, Calif.
USE OF HARMONIC ANALYSIS IN COMBUSTION INSTABILITY
P. L. Micheli *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 57-71 refs (For primary document see N82-21378 12-28)
(Contract F04611-81-C-0007)
Avail: NTIS HC A20 CSCL 21/9

The complexity of waveforms observed in combustion instability necessitates the use of harmonic analysis to interpret the data. Questions as to whether the harmonic analysis could be made into a quantitatively useful tool were considered. A review of the results of applying harmonic analysis techniques to test data was made. Calculation procedures to establish necessary levels of accuracy are discussed. The harmonic analysis was used to evaluate amplitude and phase relationships of various modes, to measure the energy transfer between modes, and to track the wave motion through the chamber. Various problems that exist in harmonic data analysis were identified and techniques to resolve them are discussed. Author

N82-21386 Aerojet Tactical Systems, Sacramento, Calif.
NONLINEAR STABILITY FOR TACTICAL MOTORS: PULSING CONSIDERATIONS
R. L. Lovine *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 73-79 refs (For primary document see N82-21378 12-28)
(Contract F04611-81-C-0007)
Avail: NTIS HC A20 CSCL 21/9

Tactical rocket motors with moderate to high length to dia ratios are known to be susceptible to nonlinear instability. To demonstrate the nonlinear stability of a specific design, a pressure disturbance was introduced to the combustion chamber and the response monitored. If the pressure pulse triggerred is an instability, the motor propellant system was considered to be nonlinearly unstable, and conversely. This introduced the problem of determining what constituted realistic motor pulse testing. It was considered that a motor may have contained in it the capability for self pulsing, such as igniter debris or alumina slag which may be ejected through the nozzle, causing a pulse. to realistically specify a motor pulse test plan it must be known how the magnitude and wave form characteristics of the induced pulses compare with those due to self pulsing with respect to triggering potential. Therefore, it was necessary to first characterize pulse units used for pulse testing, and second to develop designs with sufficient flexibility to simulate self pulsed wave forms. Progress toward these objectives is presented. Author

N82-21387 Aerojet Tactical Systems, Sacramento, Calif.
THE EFFECT OF MODE COUPLING ON COMBUSTION STABILITY
P. L. Micheli *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 81-91 refs (For primary document see N82-21378 12-28)
(Contract F04611-81-C-0007)
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A mode coupling study was conducted which provides guidelines of conditions necessary to trigger instability and relationships between the system growth rates and limit cycle behavior. Mode coupling was shown to be a mechanism of transfering energy from lower to higher modes, but not of being a source of instability. To trigger, at least one mode must be made unstable and have an amplitude dependent driving source. This mode was the lowest observed. Harmonic analysis techniques were developed which provided a means of calculating the mode growth rates from limit cycle information. Author

N82-21388 Naval Postgraduate School, Monterey, Calif.
AN INVESTIGATION OF PARTICULATE BEHAVIOR IN SOLID PROPELLANT ROCKET MOTORS
D. W. Netzer and S. G. Karagounis *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 93-110 refs (For

primary document see N82-21378 12-28)
(Contract F04611-80-X-0032)
Avail: NTIS HC A20 CSCL 21/9

An apparatus was developed which used diffractively scattered laser power spectra measurements for determination of exhaust particulate size from solid rocket motors. The apparatus was calibrated by using glass beads and aluminum oxide powder, and then used with success to estimate the mean diameter of the exhaust particles of a small solid rocket motor. Scanning electron microscope measurements of the exhaust particles were employed for comparison and verification. Holographic pictures from burning propellant strands of different compositions were obtained at different pressures and compared to corresponding high speed, high resolution motion pictures. Author

N82-21389 Purdue Univ., Lafayette, Ind.
COMMENTS ON ALUMINUM PARTICLE SIZE, AGGLOMERATION, AND ACCELERATION EFFECTS ON SOLID PROPELLANT BURNING BEHAVIOR **c38**
J. P. Renie and J. R. Osborn *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 111-120 refs (For primary document see N82-21378 12-28)
(Grant AF-AFOSR-3381-77)
Avail: NTIS HC A20 CSCL 20/9

Results from modeling the behavior of aluminum within the framework of a theoretical, composite solid propellant combustion model, the PEM are presented. The behavior of aluminum during the burning process is assumed to be a mean propellant surface/near surface phenomenon. A mean surface/near surface environment was proposed including a subsurface thermal profile, a possible thin liquid surface relation zone, or melt layer, and a finite width gas phase reaction zone. Each particle within the aluminum distribution was assumed to emerge from the propellant surface, melt, ignite and burn with a release of energy while flowing away into the gas phase region above the propellant surface. Such an in depth consideration of the mean surface/near surface interaction with the aluminum particle size distribution along with the oxidizer distribution information permits postulation of an agglomeration mechanism. Preliminary results of the current aluminum modified PEM, or ALPEm, concentrating primarily on the effects of aluminum particle size on overall propellant burning characteristics are presented along with comments on future agglomeration modeling efforts. Results demonstrating the effects caused by an imposition of an acceleration field in light of the new aluminum modeling approach are also presented. M.D.K.

N82-21390 Georgia Inst. of Tech., Atlanta.
THE NATURE AND COMBUSTION OF AGGLOMERATES
E. W. Price, C. J. Park, R. K. Sigman, and J. K. Sambamurthi *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 121-145 refs Sponsored in part by Aluminum Company of America (For primary document see N82-21378 12-28)
(Contract F49620-78-C-0003)
Avail: NTIS HC A20 CSCL 21/9

A summary of the behavior of aluminum on the propellant burning surface is given to provide a basis for understanding the nature of agglomerates. The results of an experimental study of the combustion of agglomerates are presented and discussed. The experimental study was based on quench collection of agglomerates and products by ethanol impingement. Examination of quench samples from tests at different quench distances, pressure, and with different propellants clarified the agglomerates combustion process and the nature and source of various oxide particles. Approximate combustion time was determined and mass fractions of oxide products in fine smoke form and coarser residual oxide droplet form were determined. Author

N82-21391 Georgia Inst. of Tech., Atlanta.
COMBUSTION OF HIGH ALUMINUM CONTENT SOLID PROPELLANTS
E. W. Price, J. K. Sambamurthi, R. K. Sigman, and C. J. Park *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 147-159 refs (For primary document see N82-21378 12-28)
(Contract F49620-78-C-0003)
Avail: NTIS HC A20 CSCL 21/9

Observations were made of the combustion behavior of aluminum in laboratory scale tests on a series of ammonium perchlorate hydrocarbon fuel model propellants with aluminum contents up to 35% burning at 6.9 MPa. Use of aluminum contents up to 25% had only moderate effect on combustion intensity or burning rate. Significant effects of amount and kind of hydrocarbon fuel (binder), type of aluminum powder, and pressure were observed. M.D.K.

N82-21392 Naval Weapons Center, China Lake, Calif.
A 35 GIGAHERTZ SYSTEM FOR MEASUREMENT OF SOLID PROPELLANT ACOUSTIC COMBUSTION RESPONSE
H. B. Mathes and J. W. Battles *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 161-165 refs (For primary document see N82-21378 12-28)
Avail: NTIS HC A20 CSCL 21/9

A millimeter wave system is described which was adapted to the measurement of both steady and dynamic burning rates of solid propellants. The measurement system, which is not restricted with regard to size and shape of the propellant sample, was used in conjunction with conventional T-Burner hardware. In its early development stages, the system was being used to measure pressure coupled response. It is readily adaptable to the measurement of velocity coupled response and that possibility is discussed. Results of initial evaluation and testing are discussed, as well as problems encountered with data acquisition and processing, which was dealt with by a combination of analog and digital techniques. Author

N82-21393 Army Armament Research and Development Command, Dover, N. J. Large Caliber Weapon Systems Lab.
COHERENT ANTI-STOKES RAMAN SPECTROSCOPY OF GUN PROPELLANT FLAMES: INVESTIGATION OF HIGHER HOT BAND AND CONCENTRATION EFFECTS IN THE SPECTRA
L. E. Harris *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 167-176 refs (For primary document see N82-21378 12-28)
Avail: NTIS HC A20 CSCL 21/9

Nitrogen coherent anti-Stokes Raman spectroscopy (CARS) spectra from air/AR mixtures with nitrogen at concentrations near 10%, and from flames of propane/air mixtures of various equivalence ratios were investigated. The CARS spectra from the air/Ar mixtures differed substantially from spectra of mixtures with higher nitrogen concentrations but agreed with calculated spectra. A resolved second hot band, Q23, at 22.69 cm, and a third hot band, Q34, near 22.41 cm, were observed. Thermochemical calculations performed to assess the accuracy of the experimentally determined temperatures indicated good agreement. J.D.H.

N82-21394 Naval Weapons Center, China Lake, Calif.
PROBLEMS ENCOUNTERED IN THE INSTALLATION OF THE NWC CO2 LASER IGNITION SYSTEM
D. E. Zurn, A. I. Atwood, T. L. Boggs, and T. Parr *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 177-182 (For primary document see N82-21378 12-28)
Avail: NTIS HC A20 CSCL 21/9

The installation of a CO2 laser ignition system for ignitability testing at the Naval Weapons Center is described. Laser beam stability, diffraction, homogeneity, calibration, and rise time are discussed. J.D.H.

N82-21395 Hercules, Inc., McGregor, Tex.
WORKSHOP REPORT: BURN RATE DETERMINATION METHODOLOGY
W. T. Brooks *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 183-191 ref Conf. held in Anaheim, Calif., 1979 (For primary document see N82-21378 12-28)
Avail: NTIS HC A20 CSCL 21/9

Existing methods of propellant burn rate determination were evaluated and compared with a proposed industry standard method. Test motors were identified, and their usage, test methods, and extent of application to a standard test motor discussed. Methods of data reduction and analysis were considered. Burn rate correlation tolerances and their application to the proposed method were discussed. J.D.H.

N82-21396 Naval Weapons Center, China Lake, Calif.
THE EFFECT OF AGING ON THE IGNITION OF TRIDENT

VTG-5A PROPELLANT
A. I. Atwood, D. E. Zurn, T. L. Boggs, C. F. Price, and L. M. Stayton *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 193-213 refs (For primary document see N82-21378 12-28)
Avail: NTIS HC A20 CSCL 21/9

A summary of the progress made on an accelerated aging program for VTG-5A Second Stage Trident propellant is given. Data presented include ignitability as determined using a xenon arc image furnace and carbon dioxide laser, burn rate, and qualitative surface analysis of the artificially aged propellants. Author

N82-21397 Pennsylvania State Univ., University Park. Dept. of Mechanical Engineering.
A COMPREHENSIVE IGNITION MODEL FOR COMPOSITE SOLID PROPELLANTS
A. K. Kulharni, M. Kumar, and K. K. Kuo *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 215-223 refs (For primary document see N82-21378 12-28)
(Contract N00014-79-C-0762)
Avail: NTIS HC A20 CSCL 21/9

A comprehensive theoretical model for ignition of solid propellants is proposed. The model allows a realistic description of the heterogeneous propellant ignition by including the effect of pressurization (dp/dt) in surrounding gases, by considering detailed reaction kinetics for AP/PBAA propellant, and by making no a priori assumption about the site of ignition. The physical model consideers a cylindrical pellet-shaped oxidizer particle embedded in a fuel binder matrix. The mathematical model consists of; energy equations for oxidizer and fuel binder in the solid phases, and mass, energy, and species conservation equations in the gas phase. Experimentally measured pressure time trace near the propellant sample surface is considered to be an input to the model. The reaction mechanism requires the consideration of five species in the gas phase. Both subsurface and gas phase reactions are considered. The proposed model could serve as a framework for the formulaton of ignition models for different propellants under a wide range of operating conditions. Author

N82-21398 Atlantic Research Corp., Alexandria, Va.
IGNITION AND COMBUSTION OF BORON PARTICLE AND CLOUDS
Merrill K. King *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 225-241 refs (For primary document see N82-21378 12-28)
(Contract F49620-81-C-0035)
Avail: NTIS HC A20 CSCL 21/9

A review of domestic and foreign literature in the area of boron ignition and combustion is presented. Included are single particle and cloud studies, both experimental and theoretical. Attempts are made to reconcile differences between investigators in both areas. In addition, the relevance of the work reviewed to practical combustor situations is discussed. Finally, gaps in the existing knowledge are defined and suggested relevant research topics for closure of these gaps are listed. Author

N82-21399 Pennsylvania State Univ., University Park. Dept. of Mechanical Engineering.
INVESTIGATION OF COMPOSITE PROPELLANT IGNITION UNDER RAPID PRESSURIZATION
J. E. Wills, M. Kumar, A. K. Kulkarni, M. Hund (Fraunhofer-Inst. fuer Treib-und Explosivstoffe), and K. K. Kuo *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 243-262 refs (For primary document see N82-21378 12-28)
(Contract N00014-79-C-0762)
Avail: NTIS HC A20 CSCL 21/9

Ignition of AP-based composite solid propellants located at the tip of an inert crack was investigated both experimentally and theoretically. The ignition process was observed by simultaneously using a high speed camera and a fast response photodiode system. Heat flux to the propellant surface was measured with a thin film heat flux gage. Effects of pressurization rate, crack gap width, and igniter flame temperature on the ignition process were studied. Experimental results indicate that the ignition delay time decreases and the heat flux to the propellant surface increases as the pressurization rate is raised. The decrease in ignition delay with increasing pressurization is caused by enhanced heat feedback to the propellant surface at higher pressurization rates. This augmentation in heat feedback to the propellant at higher pressurization is believed to be a result of a combination of the following mechanisms: heating due to compression wave reflection at the closed end; heat transfer due to recirculating hot gas near the tip; heat release due to burning unreacted igniter species (or particles) near the tip, behind the compression wave; and increase in enthalpy of the gas adjacent to the propellant surface due to continued pressurization of the crack cavity. Author

N82-21400 Ballistic Research Labs., Aberdeen Proving Ground, Md.
A COMPLETE NUMERICAL SOLUTION OF THE IGNITION AND COMBUSTION OF A REACTIVE PROPELLANT IN NON-STEADY REACTIVE STAGNATION FLOW
A. Birk *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 253-275 refs (For primary document see N82-21378 12-28)
Avail: NTIS HC A20 CSCL 21/9

The ignition dynamics of a reactive homogeneous propellant immersed in a hot, reactive, low subsonic flow is solved numerically for the stagnation point. The solution includes the entire ignition process from the onset of the flow to the attainment of steady burning under steady flow. The gas phase equations are of the non-steady boundary layer type, including free stream nonsteadiness. The reactive gas phase is coupled to the reactive condensed phase which has reactant depletion and surface regression. Ignition delay times and dynamics are calculated for variations in flow velocity, pressure, temperature, free stream oxidizer content, condensed phase activation energy and heat of reaction, and initial propellant temperature. The transition from one steady burning state to another after a pressure pulse is also investigated. Conditions are identified when dominance shifts from the condensed phase to the gas phase. Excursions of the condensed phase reaction front cause fluctuations of the surface temperature (hence regression rates) before steady burning. In marginal cases (e.g., low initial propellant temperature), the excursions trigger a low frequency, ignition extinction sequence. Author

N82-21401 Hercules, Inc., McGregor, Tex.
RELATIONSHIPS AMONG SOLID PROPELLANT TEMPERATURE SENSITIVITY PARAMETERS
W. T. Brooks and R. R. Miller *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 277-283 refs (For primary document see N82-21378 12-28)
Avail: NTIS HC A20 CSCL 21/9

Solid propellant temperature sensitivity definitions and current application are reviewed. Lack of compliance in present practice with intended original meanings of the terms and their symbols results in inaccuracy in the value typically reported for pi sub K, the temperature sensitivity of pressure at constant K sub n (ratio of burning surface to nozzle throat area). Because of continual application of the symbol pi sub K in this manner over many years, it may be well to revise its definition from original intents proposed by early writers in order to conform to practice. It is unlikely after so many years of usage that the propulsion community would revert to the correct symbol, pi sub p/r, and name for the value typically reported as pi sub K. A recommendation is made to alter symbols and definitions only slightly to distinguish between pi sub K based on subscale motor burn rate data and pi sub K based on full scale motor firings at constant Kn. The former would be referred to as pi sub k, and the latter would be referred to as pi sub kn. Author

N82-21402 Brigham Young Univ., Provo, Utah.
DIFFUSION FLAME STRUCTURE
H. B. Eldredge, M. W. Beckstead, and S. C. White *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 285-295 refs (For primary document see N82-21378 12-28)
(Grant AF-AFOSR-0100-79)
Avail: NTIS HC A20 CSCL 21/9

Application of a modified Burke-Schumann analysis of diffusion flames to an investigation of the mechanisms of solid propellant combustion is described. The Mitchell-Sarofim numerical model for solving the equations of continuity, motion, energy, and species continuity for a diffusion flame were applied to solid propellant diffusion flame configurations. Use of this model not only relaxes many of the assumptions that are involved in

analytical solutions, but allows evaluation of many of the assumptions as well as examination of the primary variables of interest. In addition to calculating the flame shape, the numerical solution allows examination of temperature, velocity and species concentrations throughout the flame. Parametric calculations are made and compared with the Burke-Schumann calculations. The primary variables discussed are the effect of particle size, differing oxidizer/fuel velocities, and oxidizer/fuel concentrations. J.D.H.

N82-21403 Naval Surface Weapons Center, Dahlgren, Va.
COMBUSTION MECHANISMS OF LEAD-SALT-CATALYZED DOUBLEBASE PROPELLANTS
G. B. Wilmot, E. G. Powell, J. Sharma, and D. Carlson *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 297-306 refs (For primary document see N82-21378 12-28)
Avail: NTIS HC A20 CSCL 21/9

The combustion mechanisms of double base rocket propellants catalyzed by lead salt burning rate modifiers were studied. The methods used to prepare quenched burned propellant surfaces, the analytical techniques evaluated to measured reactant and product concentrations in the condensed phase combustion zones, and the results of the X-ray photoelectron spectroscopic, liquid and gel permeation, and chromatographic and Fourier transform infrared spectroscopic analyses are discussed. Author

N82-21404 California State Univ., Sacramento.
ANALYSIS OF VERY LOW FREQUENCY OSCILLATIONS IN A RAMJET COMBUSTOR BY USE OF A SENSITIVE TIME LAG MODEL
In APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 307-316 refs (For primary document see N82-21378 12-28)
(Contract F336157-77-C-2004)
Avail: NTIS HC A20 CSCL 21/9

Pressure oscillations in ramjet combustor were investigated. Coaxial dump combustor configurations and on very low frequency oscillations, oscillations in which the acoustic modes of the combustion chamber are not excited was emphasized. The main features of the analysis are: compressible flow in the air inlet system, bulk oscillations in the combustor, and a combustion response characterized by a time lag sensitive to combustor conditions. Two studies were undertaken by using the analytical model: (1) an empirical correlation for the time lag based on steady state performance data was used; (2) consisted of the calculation of stability limits for the time lag and combustor geometry for various sets of operating conditions. Comparison of the analytical stability limits with the experimental results gave time lag values, which are compared with the empirical correlation used in the first study. E.A.K.

N82-21405 McDonnell-Douglas Research Labs., St. Louis, Mo.
FACTORS INFLUENCING VELOCITY DISTRIBUTIONS AT INLET/COMBUSTOR INTERFACES
M. Sajben, T. J. Bogar, J. C. Krutil, and J. T. Salmon *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 321-331 refs (For primary document see N82-21378 12-28)
(Contract F49720-77-C-0082)
Avail: NTIS HC A20 CSCL 21/9

Flows in six nominally two dimensional, supercritical diffusers, to highlight the effects of selected parameters and operating conditions on the velocity distributions at the downstream end are reviewed. The state of the flow at this location has a significant influence on the performance and stability of liquid fuel ramjet burners. The investigated parameters include the diffuser exit area/throat area ratio, the terminal shock strength and the boundary layer thickness before the throat. The terminal shock strength was found to be a major factor. Initial boundary layer thickness had only moderate effects on the efflux conditions. It is suggested that methodology developed for assuring inlet engine compatibility in turbojet propulsion systems could be modified to aid ramjet development. E.A.K.

N82-21406 United Technologies Corp., Sunnyvale, Calif. Chemical Systems Div.
REPORT OF THE JANNAF WORKSHOP ON HIGH FREQUENCY INSTRUMENTATION AND DATA ANALYSIS TECHNIQUES
P. A. Chun (Naval Weapons Center, China Lake, Calif.) and R. S. Brown *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 333-339 refs Conf. held in New Orleans, 28-29 May 1981 (For primary document see N82-21378 12-28)
Avail: NTIS HC A20 CSCL 21/9

Pressure oscillations in ramjet combustor, instabilities and transients in ramjet engines and facilities were discussed. The development of ramjets and ramrockets and experience with pressure oscillations in other airborne propulsion systems is examined. Current high frequency instrumentation methods and data analysis practices are reviewed. Guidelines for the consistent and proper use of high frequency response instrumentation on ramjet engine and component testing and data acquisition, recording, analysis, and interpretation techniques are considered. Procedures are presented for obtaining consistent, useful, and repeatable pressure oscillation data. E.A.K.

N82-21407 Naval Weapons Center, China Lake, Calif.
COMBUSTION INSTABILITY IN A RESEARCH DUMP COMBUSTOR: INLET SHOCK OSCILLATIONS
K. C. Schadow, J. E. Crump, and F. S. Blomshield *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 341-356 refs (For primary document see N82-21378 12-28)
Avail: NTIS HC A20 CSCL 21/9

Inlet shock displacement and diffuser exit pressure oscillation properties were determined for a coaxial, 5 inch diameter ramjet combustor using Schlieren photography and high frequency pressure transducers. Shock and pressure display similar frequency content and wave structure. The shock responds to pressure fluctuations in a quasi steady fashion with regard to displacement amplitude. Mean shock position and shock Mach number, as function diffuser exit Mach number and pressure, are predicted by one dimensional theory considering a subsonic diffuser loss, which increased with increasing exit Mach numbers. E.A.K.

N82-21408 Naval Weapons Center, China Lake, Calif.
COMBUSTION INSTABILITY IN A RESEARCH DUMP COMBUSTOR: PRESSURE OSCILLATIONS
J. E. Crump, K. C. Schadow, F. S. Blomshield, and C. J. Bicker *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 357-370 refs (For primary document see N82-21378 12-28)
Avail: NTIS HC A20 CSCL 21/9

Combustion instability in ramjets was investigated. Axial acoustic modes and their effect on the inlet shock are examined. The pressure oscillations are treated. Dynamic pressure measurements of 10 locations along the inlet/combustor length determined the acoustic mode structure and magnitude of the pressure oscillations. The importance of operating conditions such as air/fuel ratio, combustor mean pressure, fuel injector location, fuel injection velocity, and air and flow rate is determined. The amplitude of the pressure oscillations indicates the importance of the various parameters. Severities (peak to peak pressure amplitude divided by the mean pressure) as high as 0.75 (accompanied by pressure wave form distortion) are measured. Both ethylene and JP-4 are used as fuels. E.A.K.

N82-21409 Marquardt Corp., Van Nuys, Calif.
A NOTE ON LONGITUDINAL PRESSURE OSCILLATIONS IN RAMJET COMBUSTORS
R. W. Byrne *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 371-376 refs (For primary document see N82-21378 12-28)
Avail: NTIS HC A20 CSCL 21/9

Oscillation phenomena in ramjet dump combustors based on a vortex shedding/feedback mechanism similar to that associated with jet flow are described. This mechanism, when coupled with the acoustic properties of the combustion chamber, leads to a condition for large amplitude oscillations which is experienced in ramjet dump combustors. The other condition required for high amplitude oscillations is the satisfaction of the Rayleigh criterion at a suitable location in the combustion chamber. The coupling of the feedback mechanism and the acoustic properties of the combustion chamber are treated. Comparison of prediction oscillation characteristics obtained using a preliminary model with experimental results are presented. E.A.K.

N82-21410 Boeing Aerospace Co., Seattle, Wash.
A TECHNIQUE FOR RAPID ANALYSIS OF INTERACTIONS

BETWEEN SFRJ FUEL REQUIREMENTS AND MISSILE MISSION PERFORMANCE
B. M. Dunn and L. E. Fink *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 377-401 refs (For primary document see N82-21378 12-28)
Avail: NTIS HC A20 CSCL 21/9

The integral rocket solid fuel ramjet propulsion system is ideally suited for missile applications because of its all solid fuel and boost propellant features. While conceptually simple, it is difficult to analyze and design because of complex sizing and performance interactions among the fuel, engine, trajectory, and missile size. Fundamental solid fuel ramjet sizing considerations and mission performance considerations are reviewed. The use of analytical technique, ARES, to provide a rapid assessment of these interactions is discussed. Examples are presented which emphasize the interactions between solid fuel characteristics and missile mission performance. E.A.K.

N82-21411 Georgia Inst. of Tech., Atlanta.
EXTERNAL/BASE BURNING FOR PROPULSION
W. C. Strahle, J. E. Hubbartt, and R. E. Walterick *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 403-406 refs (For primary document see N82-21378 12-28)
(Contract FA9620-78-C-0003)
Avail: NTIS HC A20 CSCL 21/9

External or base burning or a combination thereof to achieve drag modification is discussed. With pure external burning the specific impulse performance is quite poor for large base pressure rises. It is determined that for low drag reduction pure base burning is efficient, and that the combination of base burning and external burning may be attractive for moderate drag reduction. It is concluded that: (1) base burning reduces base drag at efficiencies comparable to or greater than a ramjet at the same flight conditions; (2) the primar, performance determined for cold injectants is the heat release rate in the wake, independently of fuel composition; (3) performance increases are attained in part of the fuel is preburned before injection. E.A.K.

N82-21412 Michigan Univ., Ann Arbor. Dept. of Aerospace Engineering.
EFFECT OF TURBULENCE IN SPRAY COMBUSTION
J. F. Driscoll *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 407-414 refs (For primary document see N82-21378 12-28)
Avail: NTIS HC A20 CSCL 21/9

By combining laser velocimetry and holography, information is obtained about the basic way in which a fuel spray burns. A laser Doppler velocimeter measurements in a spray flame are described. The LDV data are used to determine the mean turbulent eddy size and the group combustion number in the flame. The mean eddy size is useful input to combustion models using a mixing length or a coherent vortex concept. The group combustion number is used to predict whether appreciable premixing occurs before combustion, or if individual flames occur about each droplet, or if group combustion of the droplets occurs. Holography observes the flamefront locations and identifies how local temperature nonuniformities occur. E.A.K.

N82-21413 Marquardt Corp., Van Nuys, Calif.
FIREBRAND RAMJET PROPULSION SYSTEM DEVELOPMENT
W. R. Jones and G. R. Ranslem *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 415-444 refs (For primary document see N82-21378 12-28)
Avail: NTIS HC A20 CSCL 21/9

The development of the Navy/Teledyne Ryan Aeronautical FIREBRAND vehicle which is an antiship missile target used to evaluate current and future onboard weapon system effectiveness against a group of enemy threats is discussed. The cruise propulsion thrust for the FIREBRAND vehicle is supplied by two identical normal shock inlet ramjet engines. The development of phases 1 and 2 which led to the PFRT/Qual tests are reviewed of pressure recovery and combustion efficiency with respect to fuel-air ratio at various altitudes and Mach numbers was tested. Durability of the flightweight hardware is discussed. The integrated fuel control prformance is also reported. Plans for the PFRT/Qual test are outlined. E.A.K.

N82-21414*# National Aeronautics and Space Administration. White Sands Test Facility, N. Mex.
MEASUREMENT OF THE SPATIAL DEPENDENCE OF TEMPERATURE AND GAS AND SOOT CONCENTRATIONS WITHIN LARGE OPEN HYDROCARBON FUEL FIRES
Harry T. Johnson, Larry J. Linley, and Joseph A. Mansfield Mar. 1982 74 p
(NASA-TM-58230; JSC-16864; NAS 1.15:58230) Avail: NTIS HC A04/MF A01 CSCL 21D

A series of large-scale JP-4 fuel pool fire tests was conducted to refine existing mathematical models of large fires. Seven tests were conducted to make chemical concentration and temperature measurements in 7.5 and 15 meter-diameter pool fires. Measurements were made at heights of 0.7, 1.4, 2.9, 5.7, 11.4, and 21.3 meters above the fires. Temperatures were measured at up to 50 locations each second during the fires. Chemistry samples were taken at up to 23 locations within the fires and analyzed for combustion chemistry and soot concentration. Temperature and combustion chemistry profiles obtained during two 7.5 meter-diameter and two 15 meter-diameter fires are included. Author

N82-21415*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RESONANCE TUBE HAZARDS IN OXYGEN SYSTEMS Ph.D. Thesis - Toledo Univ., 1975
Bert R. Phillips 1982 25 p refs Presented at Symp. on Flammability and Sensitivity of Mater. in Oxygen Enriched Atmosphere, Phoenix, Ariz., 31 Mar. - 1 Apr. 1982; sponsored by the Am. Soc. for Testing and Mater.
(NASA-TM-82801; E-1140; NAS 1.15:82801) Avail: NTIS HC A02/MF A01 CSCL 21D

An experimental and analytical program was carried out to determine whether fluid dynamic oscillations could create a hazard in gaseous oxygen flow systems. The particular fluid dynamic oscillation studied was the resonance tube phenomena as it was excited in a tee-shaped configuration characteristic of configurations found in many industrial high pressure gas flow systems. The types of hazards that could be caused by the oscillations were direct heating and ignition of the piping system by the gas, the greatly augmented heating that could occur if inert contaminants were present, and the ignition of metallic contaminants. Asbestos was used as the inert contaminant; titanium, aluminum, magnesium and steel were chosen as ignitable metallic contaminants. The oscillations in the tee-shaped configuration were compared to oscillations driven by choked convergent nozzles and were found to differ markedly. Temperature generated at the end or base of the resonance tube exceeded 1089 K for both gaseous oxygen and nitrogen and reached 1645 K when asbestos was added. Aluminum in both powder and fiber form was readily ignited within the resonance tube when the supply pressures were less than 8270 kPa whereas at higher supply pressures the mixture exploded with enough violence to destory the apparatus in less than 10 sec. In addition to aluminum, magnesium, and titanium, samples of 400 series stainless steels were also ignited within the resonance tube. The ignition occurred within a few seconds after the oxygen flow began. Author

N82-21416# Materials Research Labs., Melbourne (Australia).
HYDROCRACKING OF THE OILS OF BOTRYOCOCCUS BRAUNII TO TRANSPORT FUELS
L. W. Hillen, G. Pollard, L. V. Wake, and N. White Jul. 1980 23 p refs
(MRL-R-783; AR-002-170) Avail: NTIS HC A02/MF A01

Hydrocarbon oils of the alga Botryococcus braunii, extracted from a natural 'bloom' of the plant, were hydrocracked to produce a distillate comprising 67% a petrol fraction, 15% an aviation turbine fuel fraction, 15% a diesel fuel fraction, and 3% residual oil. The distillate was examined by a number of standard petroleum industry test methods. This preliminary investigation indicates that the oils of B. braunii are suitable as a feedstock material for hydrocracking to transport fuels. Author

N82-21417# Materials Research Labs., Melbourne (Australia).
THE EFFECT OF CRYSTAL ORIENTATION ON GROWTH ON POLYCRYSTALLINE TNT
William S. Wilson May 1980 17 p refs

(MRL-R-775; AR-002-156) Avail: NTIS HC A02/MF A01

Dimensional instability of polycrystalline TNT was found to depend markedly on crystal orientation within the specimen. Growth or irreversible expansion on thermal cycling was observed to be large in a particular direction if there was a 'texture' of crystals with high and low coefficients of thermal expansion in that direction which interacted to produce large intercrystalline stresses. Growth was smaller when the crystals were so arranged that there was no such interactions and the intercrystalline stresses generated in that direction were small. Creamed TNT with its random crystal orientation generated equal intercrystalline stresses in all directions on thermal cycling, and growth was found consequently equal in all directions. The results ae consistent with the 'ratchet' mechanism proposed previously to account for growth in polycrystalline TNT. M.D.K.

N82-21418# Materials Research Labs., Melbourne (Australia).
METAL JET INITIATION OF BARE AND COVERED EXPLOSIVES. SUMMARY OF THE MECHANISM, EMPIRICAL MODEL AND SOME APPLICATIONS
M. C. Chick and D. J. Hatt Oct. 1981 20 p refs
(MRL-R-830; AR-002-735) Avail: NTIS HC A02/MF A01

The mechanisms and factors that control the sensitivity of bare and covered explosives to attack from shaped charge jets are determined. The mechanism of the initiation process was studied using multiple flash X-radiography. The sensitivity of explosives to a jet in terms of the thickness of a steel barrier that will allow detonation in 50% of the firings is tested. The general mechanism proposed is illustrated by systems that produce strong initiating shocks, weak initiating shocks and failure shocks in composition B. An empirical model is described which calculates the pressure of jet impact, and follows the shock produced through the steel covering and into the explosive. Calculated shock pressures and corresponding velocities in Composition B are in good agreement with those determined experimentally. The shock pressure profile through the steel barrier in the empirical model is used to convert the measured critical barrier thicknesses to the critical initiating shock pressures for four explosives, (creamed TNT, composition B, pressed TNT, pressed tetryl). S.L.

N82-21419# Materials Research Labs., Melbourne (Australia).
RECRYSTALLIZED RDX FOR RDX/POLYETHYLENE WAX COMPOSITIONS
William S. Wilson May 1980 25 p refs
(MRL-TN-436) Avail: NTIS HC A02/MF A01

The impact and shock sensitivities of RDX/polyethylene wax compositions prepared from RDX Grade A Class 1 (recrystallized from cyclohexanone) were measured using the Rotter Impact Test and Gap Test respectively, and the results were compared with those obtained for compositions prepared from RDX Grade B Class 1 (milled and boiled). The increased impact sensitivity and decreased shock sensitivity of the compositions based on the recrystallized RDX are attributed to the presence of occluded cyclohexanone and the increased particle size. Author

N82-21420# Materials Research Labs., Melbourne (Australia).
DESIGN OF A COMPOSITE CHARGE FOR A 12.7 MM SMOOTH-BORE EXPERIMENTAL GUN
Michael J. Chung May 1981 28 p refs
(MRL-TN-451) Avail: NTIS HC A03/MF A01

A mathematical model describing the interior ballistics of a smooth bore experimental gun was used to optimize the composition of a composite propellant charge for achieving muzzle velocities of 1500 m/s with projectiles of 23 g (0.051 lb). Comparison of predicted and experimental results indicate, however, that this gun is subjected to excessive leakage. If this problem can be overcome, muzzle velocities of 1900 m/s may be attained using the recommended composite charge and existing gun specification. B.W.

N82-21421# Materials Research Labs., Melbourne (Australia).
MODIFICATION OF THE TECHNIQUE FOR THE MECHANICAL POLISHING OF CAST TNT COMPOSITIONS
M. A. Parry 1981 12 p refs
(MRL-TN-456) Avail: NTIS HC A02/MF A01

Previous work at Materials Research Laboratory established a technique for the mechanical polishing of specimens of cast TNT compositions. Due to the unavailability of materials used in the technique, modifications were made which maintained the high quality finish observed previously. Author

N82-21422# Materials Research Labs., Melbourne (Australia).
A MINIATURE IONIZATION PROBE TECHNIQUE USING A MULTILAYER CIRCUIT BOARD FOR THE STUDY OF EXPLOSIVE PHENOMENA IN PRIMARY AND SECONDARY EXPLOSIVES
Robert J. Spear, John R. Bentley, and Michael G. Wolfson May 1981 22 p refs
(MRL-R-815) Avail: NTIS HC A02/MF A01

A miniature ionization probe technique using a multilayer circuit board was developed. Full experimental details including construction of the boards, explosive charge preparation and instrumentation are reported. Each copper layer in the circuit board functions as an ionization probe and optimum conditions were achieved with a probe density of 15 per cm, i.e., probe separation about 0.75 mm. Explosive samples were studied in a geometry similar to that of practical fuze detonators; the pressed explosive columns were 5 to 8 mm long and masses ranged from 0.58 g to only 0.08 g. Accurate, reproducible detonation velocity measurements have been obtained for the primary explosives service lead azide, at a wide range of densities, lead azide RD1343, silver azide and mercuric 5-nitrotetrazole and the secondary explosive tetryl. Some potential improvements and future uses of the technique are discussed. B.W.

N82-21423# Applied Combustion Technology, Inc., Orlando, Fla.
AN EXPLORATORY INVESTIGATION OF THE INFLUENCE OF IGNITER CHEMISTRY ON IGNITION IN POROUS BED GUN PROPELLANTS Final Report, May - Sep. 1981
John Martino and Michael Varney Sep. 1981 100 p
(Contract N00174-80-C-0138)
(AD-A110193; ACT-TR-8125-2) Avail: NTIS HC A05/MF A01 CSCL 19/1

In order to quantitize the ignition effectiveness of an igniter material, it is desirable to establish both the total energy deposition and the rate of energy deposition required to produce a sustained ignition in a live propellant bed. The primary objective of the current project was to use the igniter system developed under the initial phase of the contract and conduct a series of diagnostic experiments to investigate the ignitibility of NACO propellants when subjected to different ignition stimuli as represented by BP, BKNO3, and NC igniter materials. During the current contract 61 tests were conducted, including: igniter calibration with IMR 4895 to document baseline NC igniter performance; primer penetration tests with live NACO to insure that the primer input into the propellant bed would not lead to NACO ignition in the absence of igniter material; igniter penetration tests with inert simulant and NACO propellant to determine the igniter effectiveness for a fixed energy content as a function of zone thickness for an inert simulant positioned between the igniter vent and the NACO propellant; and igniter effectiveness tests with inert simulant and NACO propellant to determine the igniter effectiveness as a function of igniter energy level for a fixed zone thickness of inert simulant positioned between the igniter vent and the NACO propellant. GRA

N82-21424# Air Force Engineering and Services Center, Tyndall AFB, Fla. Engineering and Services Lab.
THE EFFECT OF FUEL COMPOSITION ON GROUNDFALL FROM AIRCRAFT FUEL JETTISONING Final Report, Mar. 1980 - Feb. 1981
Harvey J. Clewell, III Mar. 1981 35 p refs
(AF Proj. 1900)
(AD-A110305; AFESC/ESL-TR-81-13) Avail: NTIS HC A03/MF A01 CSCL 01/3

A computer model which simulates the evaporation and free-fall of fuel droplets in the atmosphere was used to determine the effect of fuel composition on the nature and extent of ground contamination by fuel discharged from an aircraft in flight. Three fuel compositions were used: (1) JP-4, the standard Air Force jet fuel; (2) Jet A (JP-8), the standard U.S. commercial jet fuel; and (3) Number 2 Diesel Fuel, representing the upper limit for future, broadened-specification fuels from alternative sources. The results of this study indicate that the amount of liquid fuel reaching the ground from the jettisoning of commercial jet fuels is much

greater than for JP-4. Moreover, future broadened specification fuels may produce even greater ground contamination when jettisoned. GRA

N82-21425# Ballistic Research Labs., Aberdeen Proving Ground, Md.
IN SEARCH OF AN IDEALIZED MODEL OF HOMOGENEOUS SOLID PROPELLANT COMBUSTION
Martin S. Miller Dec. 1981 58 p refs
(DA Proj. 1L1-61102-AH-43)
(AD-A110018; ARBRL-TR-02383) Avail: NTIS HC A04/MF A01 CSCL 21/9

A simple idealization of the steady-state deflagration of uncatalyzed, homogeneous solid propellants is examined to determine its adequacy in describing gross combustion features such as burn rate as a function of pressure and initial temperature. The idealization consists of a single condensed-phase process (pyrolysis and evaporation are considered) and a single gas-phase chemical reaction. Several analytic approximations (including one developed during the course of this work) are derived and discussed in relation to the work of other investigators. All of these approximations are shown to lead explicitly to approximate analytic expressions of the same functional form as empirical formulas for the burning rate pressure dependence. The approximation developed in this paper is shown to lead to a common empirical form for the temperature sensitivity. A means of testing the suitability of these approximations to a given propellant is also developed using temperature profiles obtained by the embedded thermocouple technique. Author (GRA)

N82-21426# Southwest Research Inst., San Antonio, Tex. Army Fuels and Lubricants Research Lab.
EVALUATION OF THE EFFECTS OF ALCOHOL FUELS ON SPARK IGNITION ENGINE WEAR Final Report, Sep. 1979 - Sep. 1981
H. W. Marbach, Jr., E. C. Owens, T. W. Ryan, III, E. A. Frame, and D. W. Naegeli Dec. 1981 115 p refs
(Contracts DAAK70-79-C-0175; DE-AI01-79CS-50030)
(AD-A110021; AFLRL-150) Avail: NTIS HC A06/MF A01 CSCL 21/7

An investigation of the effects of alcohol fuels on spark ignition engine wear and deposition was jointly sponsored by the U.S. Department of Energy and the U.S. Army Mobility Equipment Research and Development Command. Tests were conducted using neat methanol, anhydrous ethanol, and alcohol blends as fuel in a 2.3 liter engine using a modified ASTM Sequence V-D test procedure. This dynamometer testing indicates that alcohol fuels reduce the buildup of engine deposits. Also, it was found that neat methanol greatly increases engine wear rates at operating temperatures below 75 C, while anhydrous ethanol and alcohol-gasoline blends do not increase wear rates over that of unleaded gasoline. Tests were then conducted to evaluate the effects of methanol fuel on ten fully formulated lubricants and one lubricant with twelve additive composition changes. A 20 hour steady-state test was developed which shows that engine wear is inversely related to engine oil temperature when using methanol as fuel. The study shows that one lubricant appears to best control methanol-related engine wear, but still not to acceptable levels. GRA

N82-21427# Reinke (Ralph G.), Wausau, Wis.
DISTILLING ALCOHOL WITH WASTE AUTOMOBILE HEAT Progress Report
Ralph G. Reinke 26 Apr. 1981 19 p
(Contract DE-FG02-81AF-92017)
(DE82-000143; DOE/AF-92017/T1) Avail: NTIS HC A02/MF A01

A device that will utilize the waste heat of an automobile for the production of alcohol fuel and provide a means for an individual without the land or resource of an agricultural facility to have the capability of producing alcohol is discussed. The method involves piping the radiator cooling fluid through a heat exchanger constructed to serve as a distillation unit. The technical description, financial report, administration report, and problems and remedies are presented. DOE

N82-21428# Nuclear Assurance Corp., Atlanta, Ga.
FEASIBILITY STUDY OF THE COMMERCIAL PRODUCTION OF ETHANOL FROM WOOD Final Report
Jun. 1981 87 p 2 Vol.
(Contract DE-FG07-80RA-50322)
(DE82-002412; DOE/RA-50322/T1-Vol-1) Avail: NTIS HC A05/MF A01

The technical and economic feasibility (commercial viability) of constructing and operating a 25 million gallon per year ethanol plant in Georgia which uses cull timber/waste wood as feedstock is discussed. The process is based on a unique combination of existing technologies - principally dilute acid hydrolysis for glucose production from cellulose and hydrothermal decompression (steam explosion) for delignification pretreatment of wood feedstock. The conclusions are positive. The process can be successfully scaled up and a plant can be successfully constructed and operated at an attractive return on investment. A plan for meeting that objective is given. DOE

N82-21429# Nuclear Assurance Corp., Atlanta, Ga.
FEASIBILITY STUDY OF THE COMMERCIAL PRODUCTION OF ETHANOL FROM WOOD. VOLUME 2: APPENDICES 1-6 Final Report
Jun. 1981 706 p refs 2 Vol.
(Contract DE-FG07-80RA-50322)
(DE82-002410; DOE/RA-50322/T1-Vol-2) Avail: NTIS HC A99/MF A01

The development of a 25 million gallon per year ethanol plant which uses cull timber wood as feedstock is discussed. The individual reports from each subcontractor involved in the investigation are given. Included is feasibility study for fuel grade ethanol plant and reports on wood residues, biomass, and other wood fuel data. A market analysis, hydrolysis of biomass, and an alternate site evaluation and community impact assessment are included. DOE

N82-21430# North Central Consultants Ltd., Jamestown, N. Dak.
FEASIBILITY STUDY FOR ALTERNATE FUEL PRODUCTION FROM BIOMASS RESOURCES
Jun. 1981 260 p Prepared in cooperation with Katzen (Raphael) and Associates and Touche, Ross and Co.; prepared for Dawn Enterprises, Inc.
(Contract DE-FG07-80RA-50361)
(DE82-002616; DOE/RA-50361/T1) Avail: NTIS HC A12/MF A01

A 50 mm anhydrous alcohol plant is described. The plant uses barley grown in the region as the raw material to produce a motor fuel grade alcohol through a fermentation and distillation process. North Dakota lignite coal is used as the primary energy sources to produce alcohol from the barley. The site is located on an active branch of the Burlington Northern Railroad, providing efficient and economical access to North Dakota's vast lignite coal fields in western North Dakota and to the established grain and grain by-product markets of Duluth and Minneapolis. The site is also adjacent to paved secondary highways, providing access to state and interstate highway systems. The plant site is adjacent to the City of Walhalla and will be annexed to the city limits and served by community facilities. Electrical energy to operate plant equipment is partially produced by co-generation within the plant but the total electrical energy cannot be produced internally. A technical review of the plant is provided. The process, plant layout, and major equipment procurement and costs are described. A complete economic analysis is provided using the data derived from the technical evaluation and cost estimates. Siting and the environmental and socio-economic considerations are covered. A review of the proposed management and personnel structure is included. DOE

N82-21431# Alternate Energy Associates, Inc., Tucker, Ga.
FEASIBILITY STUDY OF A 3,000,000-GALLON-PER-YEAR ETHANOL-PRODUCTION PLANT IN NORTHEAST GEORGIA Final Report
Jan. 1981 216 p Prepared for CAFPRO, Inc., Athena, Ga.
(Contract DE-FG07-80RA-50321)
(DE82-002433; DOE/RA-50321/T1) Avail: NTIS HC A10/MF A01

The project was intended to convert purchased corn into ethanol and distillers dried grains using purchased electricity and waste wood for fuel for process energy. Factors including feedstock

availability, alcohol markets, by-product markets, financing costs, specific plant technologies, sources of low cost process fuel and electricity, and methods for meeting environmental requirements, were studied. Analysis procedures used centered around a computerized pro forma algorithm that computes economic performance of fuel alcohol projects under different operating conditions. Sensitivity analyses were conducted for differing feedstock costs, byproducts values, alcohol values, and interest rates. Graphs of plant economic performance are included for these various conditions. It was decided that a three million gallon per year plant size was optimum. Plant sites were considered in the general area of Athens, Georgia. Another group in the Athens area (Tallassee Power Corp.) had begun to study the feasibility of a small scale hydroelectric facility. DOE

N82-21432# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
SMALL-SCALE FUEL-ALCOHOL PLANT. VOLUME 1: DESIGN REPORT
Aug. 1981 227 p
(Contract DE-AC07-76ID-01570)
(DE82-001038; DOE/TIC-2001038-Vol-1) Avail: NTIS HC A11/MF A01

A small-scale fuel alcohol plant designed and constructed for the DOE by EG and G Idaho, Inc., an operating contractor at the Idaho National Engineering Laboratory, is described. The plant is reasonably complete, having the capability for feedstock preparation, cooking, saccharification, fermentation, distillation, by-product dewatering, and process steam generation. An interesting feature is an instrumentation and control system designed to allow the plant to run 24 hours per day with only four hours of operator attention. The production designed capacity of the plant is 26.4 gallons of 190-proof ethanol per hour. Most of the processes and equipment used in the plant represent conventional ethanol production technology. Two slight deviations are the control system, which is common in larger plants, and the continuous cooker, which was adapted from the food industry. A device for dewatering the by-product is included, but a by-product drying system was not, because systems evaluated were too expensive for a plant of this size. DOE

N82-21433# North Carolina State Univ., Raleigh. Lab. of Applied Biochemistry.
BIOLOGICAL POTENTIAL OF METHANE GENERATION FROM POULTRY WASTES Final Report
Jason C. H. Shih 20 Jun. 1981 45 p refs
(DE82-900582; NCEI-0035) Avail: NTIS HC A03/MF A01

The biological potentials of methane generation from the two major kinds of poultry wastes, the litter of broiler chickens and the manure of laying hens were investigated. Using these wastes to prepare media for bacterial growth, thermophilic anaerobic cultures were initiated by innoculations of bacteria from different natural environments. It is demonstrated that the broiler litter is a substrate of very low potential. This seems due to the high content of wood shavings resistant to bacterial degradation. The layer manure is a high potential substrate, which supported both a high ethane rate and a high methane yield. Compared with other types of animal wastes, the manure of laying hens is one of the best substrates for methane production. DOE

N82-21434# Midwest Research Inst., Golden, Colo. Solar Fuels and Chemical Research Div.
ECONOMIC IMPACTS OF ETHANOL FUELS FROM CROPS
Donald Hertzmark, Daryl Ray, and James Richardson Aug. 1981 64 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-001042; SERI/TR-734-1320) Avail: NTIS HC A04/MF A01

Agricultural production of ethanol feedstocks from grains and sugar crops were simulated. Production levels of up to 5 billion gallons per year were simulated using various combinations of corn, high energy sorghum, sweet sorghum, and sugar beets. Impact on the agricultural sector is mild at up to 2 billion gallons per year of ethanol. Beyond 2 billion gallons per year, diversification away from corn appears to be necessary to avoid major feed price inflation. Farm income unambiguously rises in response to higher crop prices. Exports of food grains are affected differently by alternative feedstocks, and high energy sorghum shows a good potential for competing with food grains. DOE

N82-21435# Bethlehem Steel Co., Pa.
COAL-GASIFICATION STUDY FOR BETHLEHEM STEEL CORPORATION'S SPARROWS POINT FACILITY
Aug. 1981 29 p
(Contract DE-FG01-79RA-20218)
(DE82-002570; DOE/RA-20218/1) Avail: NTIS HC A03/MF A01

Although processes for producing environmentally acceptable gas from coal are available commercially, the lack of commercial operating experience in the United States requires that the pioneer users principally rely on engineering and economic analysis. The uncertainty of costs, operating reliability and retrofit impacts as well as many other factors are all considerations which must be weighed seriously when considering the use of low/or medium-Btu coal gas as an alternative fuel option. Financial analysis of the coal gasification project for Sparrows Point was done. The packback period ranged from 6.9 to 15.7 years for air-blown gasification. Oxygen-blown gasification was not at all attractive. It showed a 20.7 year payback at the most favorable end of the range. Two factors affect whether a steel plant will install coal gasification - availability of purchased fuels and economics. There is little incentive to make large capital expenditures when plentiful quantities of purchased fuels are available. Based on economics, coal gasification cannot be justified. DOE

N82-21436# American Association of Community and Junior Colleges, Washington, D.C. Energy Communications Center.
ALCOHOL FUELS PRODUCTION, MANPOWER, AND EDUCATION: WHERE DO TWO-YEAR COLLEGES FIT
1981 37 p refs
(Contract DE-FG05-79IR-10295)
(DE82-001929; DOE/IR-10295/T1) Avail: NTIS HC A03/MF A01

Representatives from 2-year colleges met with officials from national organizations to discuss the role of community colleges in the training of personnel and the development of curriculum to enhance the growing alcohol fuels industry. Major conclusions include: (1) Energy issues are too important for colleges to ignore in their program offerings; each college should determine what energy focuses and what program forms make most sense for its local area; (2) Community-size alcohol plants have the potential of leading the way toward local economic development and self sufficiency; (3) Production and manpower projections vary widely from one source to another. Even if the most optimistic production levels are reached, the evidence shows that three will be only a modest need for narrowly-trained alchol fuels technicians. The most reasonable approach for colleges is to train energy generalists through curricula that focus on basic competencies in science, math, management, and communications. DOE

N82-21437# Pittsburg and Midway Coal Mining Co., Shawnee Mission, Kans.
RESEARCH ON SOLVENT-REFINED COAL Quarterly Technical Progress Report, 1 Apr. - 30 Jun. 1981
Oct. 1981 139 p refs
(Contract DE-AC22-81PC-40005)
(DE82-002530; DOE/PC-40005/5) Avail: NTIS HC A07/MF A01

Research progress on Solvent Refined Coal is reported. Alexander Mine coal was evaluated as a feedstock for major liquefaction facilities and had a yield structure similar to other reactive Pittsburgh seam coals at standard SRC II conditions. Two lots of coal from the Ireland Mine (Pittsburgh seam) were found to be of nearly the same composition and produced essentially the same yields. Two experiments in which coal-derived nonvolatile organic matter was processed without fresh coal feed indicated constant rates of conversion of SRC to oil and gas. Insoluble organic matter remained unconverted. The naphtha and middle distillate products from the deep conversion contained less sulfur but more nitrogen than those from conventional SRC II processing. Encouraging results were obtained when a very small amount of iron oxide dispersed on alumina was added to Kaiparowits coal which cannot be proposed at normal SRC II conditions without added catalyst. Subbituminous coals from

the McKinley and Edna Mines were processed successfully with added pyrite but would not run when the added catalyst was removed. DOE

N82-21438# Royal Aircraft Establishment, Farnborough (England).
HIGH-SPEED CINEMATIC STUDIES OF WATER VAPORIZATION PHENOMENA IN ELECTROTHERMAL HYDRAZINE THRUSTER SIMULATIONS
W. G. Grenhem London HMSO 18 Nov. 1980 34 p refs (RAE-TR-80144; RAE-Space-589; BR77731) Avail: NTIS HC A03/MF A01

Anomalous behavior of a prototype electrothermal hydrazine thruster (EHT) was studied. The process of vaporization was studied by high-speed cinematography, with water substituted for hydrazine in models of the EHT. Water was injected onto heated stainless steel gauzes and filming performed at 5000 frames/sec, achieving a time resolution of 0.2 ms. When the gauze pack temperature was between 473 K and 573 K, film boiling effects became apparent. The duration of splashback from the gauze surface increased with initial temperature, and vaporization in the injector reduced the initial mass flow into the thrust chamber. The results of the flow visualization research are described, and it is concluded that Leidenfrost film-boiling effects inhibits vaporization and affects the performance of the thrusters. Author (ESA)

N82-21439# Environmental Protection Agency, Ann Arbor, Mich. Control Technology Assessment and Characterization Branch.
A REVIEW OF THE COMPATIBILITY OF METHANOL/GASOLINE BLENDS WITH MOTOR VEHICLE FUEL SYSTEMS
Robert J. Garbe May 1981 18 p refs
(PB82-117904; EPA-AA-CTAB/PA/81-12) Avail: NTIS HC A02/MF A01 CSCL 21D

The compatibility effects of methanol/gasoline blends on vehicle systems were as part of a larger effort by EPA to evaluate the request fo a waiver of the Section 211(F) fuel additive regulations submitted by Anafuel Unlimited on February 20, 1981. This waiver was requested by Anafuel for Petrocoal, an oxygenated, unleaded gasoline blend containing up to 12% methanol, up to 6% C-4 alcohols (not identified) and up to 0.033 g/gal but not less than 0.023 g/gal of a proprietary compound claimed by Anafuel to be a corrosion inhibitor. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N82-21440# Applied Concepts Corp., Reston, Va.
A STUDY OF METRIC CONVERSION OF DISTILLED SPIRITS CONTAINERS: A POLICY AND PLANNING EVALUATION Phase Report, Aug. 1981
James A. Simpson Aug. 1981 184 p
(Contract AA-80-SAC-X8602)
(AD-A110223) Avail: NTIS HC A09/MF A01 CSCL 13/4

The report establishes the historical baseline regarding events that occurred, the reasons for the events, their impacts, and the lessons learned from the conversion. The report consists of eight chapters and an appendix: (1) an overview of the distilled spirits industry, (2) an analysis of the motivation phase of the conversion, (3) an analysis of the planning phase, (4) a description and analysis of the events of the implementation phase, (5) an analysis of the costs and savings resulting from the conversion, (6) an analysis of the impact of the conversion on prices of distilled spirits, (7) an analysis of the impacts on consumption, profitability, industry structure, and size, product and brand preferences, (8) a summary of the findings and conclusions from the assessment of the process, and (9) (the appendix) a detailed chronology of events. Author (GRA)

N82-21441# Lincoln Lab., Mass. Inst. of Tech., Lexington.
PROTOTYPE RESIDENTIAL PHOTOVOLTAIC-SYSTEMS EVALUATION PLANS
M. C. Russell Oct. 1981 33 p refs
(Contract DE-AC02-76ET-20279)
(DE82-004726; DOE/ET-20279/163) Avail: NTIS HC A03/MF A01

A sequence of tests is identified to assess the reliability and safety of residential photovoltaics systems. In addition, a standard means of characterizing a PV system in terms of its power and energy performance is presented. At present, these tests and characterization procedures are being applied to prototype residential systems under evaluation. DOE

N82-21442# Massachusetts Inst. of Tech., Cambridge.
SOLAR PHOTOVOLTAIC RESIDENTIAL PROJECT Monthly Management Report, 1 Jul. 1981 - 31 Jul. 1981
1981 17 p
(Contract DE-AC02-76ET-20279)
(DE82-000653; DOE/ET-20279/T11) Avail: NTIS HC A02/MF A01

Progress with technology transfer and the performance of photovoltaic power supplies in Northeastern and Southwestern residences are reported. Also, systems operation in Florida and Hawaii are discussed briefly. Technology development in the field of power conditioning and flywheel storage is described. Work on some non-residential field tests is also described. Project management data are summarized. DOE

N82-21443# Lincoln Lab., Mass. Inst. of Tech., Lexington.
CARLISLE HOUSE: AN ALL-SOLAR-ELECTRIC RESIDENCE
B. E. Nichols Oct. 1981 25 p refs
(Contract DE-AC02-76ET-20279)
(DE82-004376; DOE/ET-20279/143) Avail: NTIS HC A02/MF A01

The first solar photovoltaic house designed and constructed under the US Department of Energy's Solar Photovoltaic Residential Project was completed. The house, which is powered by a 7-kWp photovoltaic system, will be used to assess the occupants' acceptance of and reactions to residential photovoltaic systems and to familiarize utilities, builders, developers, town building officials and others with issues concerning photovoltaic installations. The house is located on a two-acre lot in Carlisle, Massachusetts, approximately twenty miles northwest of Boston. Built by a local architect/developer team, the house includes energy conservation and passive solar features. It utilizes a roof-mounted, flat-plate PV array which operates in a two-way energy exchage mode with the electric utility. The energy conservation and passive solar features of this house are described and detailed description of the utility-interactive photovoltaic system is presented, along with initial performance data. DOE

N82-21444# Grenoble Univ. (France). Inst. National Polytechnique.
CONTRIBUTION TO THE STUDY OF A MAGNETIC REFRIGERATION BETWEEN 4.2 AND 1.8 K
C. Delpuech Nov. 1980 125 p refs
(FRNC-TH-1023) Avail: NTIS (US Sales Only) HC A06/MF A01; DOE Depository Libraries

The construction of a study alternating refrigerator, essentially a double acting machine, with ancillary refrigeration by helium expansion is discussed. The refrigerator operates in a liquid helium bath at 4.2 K and the cold surface is a superfluid bath whose temperature can be brought down to 1.6 K. The magnetic components, actuated by a periodic translation movement, are magnetized cyclically in the 4.2 K bath, then demagnetized in the central bath forming the cold source. The bar slides in guide bearings, isolating the central chamber of the 4.2 K bath. This can be cooled through the copper wall by the refrigeration bath. A relief valve and a level gauge enable the operation of the ancillary refrigerator to be adjusted. A temperature of under 1.8 K was obtained in a superfluid bath at atmospheric pressure. Possible thermal exchange improvements in supercritical helium by artificially creating turbulency between two walls were studied. Some physical properties of paramagnetic rare earth salts were also studied. DOE

N82-21445# National Physical Lab., Teddington (England). Div. of Quantum Metrology.
[REPORT ON THE ACTIVITIES OF THE DIVISION OF QUANTUM METROLOGY FOR 1979] Annual Report

1979 41 p refs
(NPL-QU-AR79; ISSN-0309-3050) Avail: NTIS HC A03/MF A01

The various activities of the division include fundamental development and application of laser wavelength standards are discussed. Ultraviolet wavelength standards, contact thermometry, radiation thermometry, thermometer calibrations, and high temperature gas physics, were studied. Radiometry, research standards for thermal conductivity, environmental standards, ground level measurements, environmental standards, and upper atmosphere cooperative studies are described.
Author (ESA)

N82-21446# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium).
PRODUCTION TECHNOLOGY: OPTIMAL CHOICE OF LATHE TOOL SETUP [TECHNOLOGIE DE L'USINAGE: CHOIX OPTIMAL DES CONDITIONS DE COUPE EN TOURNAGE]
Jos Pinte and Willy DuMong Aug. 1981 66 p refs In FRENCH. Sponsored by Inst. pour l'Encouragement de la Recherche Scientifique dans l'Industrie et l'Agriculture
(CRIF-MC-70) Avail: NTIS HC A04/MF A01

A calculation method that optimizes tooling parameters is presented. Rotation speed, advance rate, lathe operational limits (power and torque), holder grip force, and starting effects on the work and the tool are determined. Factory production results, using numerically controlled machines, show a 20% time saving. The decrease in programming time, working with computed parameters, is pointed out. Better tool wear and cycle life are noted. Less machine downtime is also mentioned. Author (ESA)

N82-21447# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
SEISMIC RESPONSE OF STRUCTURAL SYSTEM WITH RANDOM PARAMETERS M.S. Thesis
Mohsen Ghafory-Ashtiany and Mahendra P. Singh Sep. 1981 107 p refs
(Grant NSF PFR-80-23978)
(PB82-123977; VPI-E-81-15) Avail: NTIS HC A06/MF A01 CSCL 13L

Seismic response depends upon its mass, stiffness and damping characteristics. Also, most building systems have eccentricity between their mass and stiffness centers which affect their dynamic response. These quantities can rarely be estimated precisely, and therefore they should be considered as random variables and the calculated dynamic response should reflect the uncertainties associated with these parameters. The sensitivity of seismic response with respect to changes in these prameters were studied. Rates of change of various response quantity with respect to the variables of mass, stiffness and eccentricity were obtained and then used in the evaluation of structural response uncertainty by a first order perturbation approach. A multistory rigid floor system was examined; its displacement, base shear, base torsional moment and column moment response characteristics were studied. GRA

N82-21448# California Energy Commission, Sacramento.
ENERGY BUILDING REGULATIONS FOR NEW RESIDENTIAL AND NONRESIDENTIAL BUILDINGS
15 Jul. 1981 73 p refs
(PB82-117813; CAEC-400-81-005) Avail: NTIS HC A04/MF A01 CSCL 13L

The proposed regulations as submitted to the State Building Standards Commission of California are presented. They are divided into four parts: applying to all occupancies; technical regulations; technical regulations applicable for ducts only; and table of contents of existing building regulations which identifies which sections will be repealed when the new regulations take effect. GRA

N82-21449# Electricity Council Research Centre, Capenhurst (England).
TRANSVERSE FLUX INDUCTION HEATING OF ALUMINUM ALLOY STRIP
R. Waggott, D. J. Walker, R. C. Gibson, and R. C. Johnson Jul. 1981 22 p refs
(PB82-121658; ECRC/M-1451) Avail: NTIS HC A02/MF A01 CSCL 13H

Transverse flux induction heating, an efficient electrical technique particularly suited to the continuous heat treatment of metal strip, is explained. Also described is a 1MW transverse flux inductor designed and built at the Electricity Council Research Centre, Capenhurst, and installed in a tension leveller line at Alcan Plate Ltd., Birmingham, UK. It has been successfully used for the continuous heat treatment of wide (1200-1250 mm) aluminum alloy strip, involving full and partial annealing at line speeds up to 2/ms as well as the solution treatment of certain high strength aluminum alloys. The advantages of this form of induction heating are compactness, controllability, hence ease of automation, and high efficiency. As a consequence, compared with existing batch and continuous heat treatment equipment, major economies in plant operation result due to reduced energy consumption as well as reduced capital and labor costs. The compactness of the technique allows the possibility of introducing transverse flux induction heat treatment furnaces into existing process lines. GRA

N82-21450# Construction Technology Labs., Skokie, Ill.
EARTHQUAKE RESISTANT STRUCTURAL WALLS: COUPLED WALL TESTS
K. N. Shiu, J. D. Aristizabal-Ochoa, G. B. Barney, A. E. Fiorato, and W. G. Corley Jul. 1981 153 p refs
(Grant NSF ENV-77-15333)
(PB82-131954; NSF/CEE-81034) Avail: NTIS HC A08/MF A01 CSCL 13M

A lightly coupled system which damaged early was first tested and then retested with the damaged coupling beams replaced by stiffer and stronger beams. The heavy coupling beams between walls caused the system to behave as a single isolated wall, and the coupling beams yielded immediately before and after the yielding of the walls. An analytical model was developed to simulate experimental results and was used to calculate the load versus deflection relationship of the coupled wall system. Using this model, inelastic shear action in the walls is found to be a significant factor in the analysis of a lightly coupled system. In heavily coupled systems, use of the model indicate that redistribution of shear and moment between walls is significant, and that interaction of axial and flexural forces is the most important factor to consider in calculating behavior of heavily coupled system. GRA

N82-21451# Construction Technology Labs., Skokie, Ill.
EARTHQUAKE RESISTANT STRUCTURAL WALLS: TEST OF WALLS WITH AND WITHOUT OPENINGS
K. N. Shiu, J. I. Daniel, J. D. Aristizabal-Ochoa, A. E. Fiorato, and W. G. Corley Jul. 1981 125 p refs
(Grant NSF ENV-77-15333)
(PB82-131947; NSF/CEE-81033) Avail: NTIS HC A06/MF A01 CSCL 13M

Two one-third scale, six-story wal specimens were subjected to inelastic load reversals representing severe earthquake forces exerted by double acting hydraulic rams, located on both sides of the wall specimens, and applied to the top of each wall. The specimens were designed of earthquake resistant reinforced concrete wall elements in coupled wall systems based on the 1976 Uniform Building Code. The loading was calculated using a modified DRAIN two-dimensional computer program with two actual earthquake records used as input ground motion data. One specimen was a solid wall and the other included six openings simulating windows. When data was normalized by yield capacities, the resonse of the two walls to the inelastic loading was similar. The presence of window openings had little effect on the deformation characteristics of the sample walls in response to the cyclic loads. GRA

N82-21452# Cornell Univ., Ithaca, N. Y. Dept. of Structural Engineering.
A STUDY OF LAPPED SPLICES IN REINFORCES CONCRETE COLUMNS UNDER SEVERE CYCLIC LOADS Progress Report
Kuruvilla LuKose, Peter Gergely, and Richard N. White Jul. 1981 223 p refs
(Grants NSF PFR-78-02399; NSF CME-80-11115)
(PB82-131798; NSF/CEE-81035) Avail: NTIS HC A10/MF A01 CSCL 13M

In an investigation of the behavior of overlapped reinforcing rods under high level, inelastic, reversing cyclic loads, 14 tests were conducted on column specimens with No. 6 spliced bars at the corners of surrounding No. 3 stirrups, subjected to combined bending and shear. The relationship between the splice length and the stirrup spacing was studied in detail. The most significant result is that a reasonable level of ductility in splices under combined bending and shear was achieved by providing uniformly spaced stirrups along the splice, and closely spaced stirrups just outside the high moment splice end. An equation for splice design was developed for specimens of the type tested. Experimental results are discussed in terms of load versus displacement, energy absorption, stiffness reduction, main bar strain variation, compression splice behavior and bond-shear interaction. GRA

N82-21453# Purdue Univ., Lafayette, Ind. Joint Highway Research Project Dept.
A ROCKWELL HARDNESS TEST FOR PORTLAND CEMENT CONCRETE Final Report
Donald N. Winslow 1 Jul. 1981 38 p refs
(PB82-126087; JHRP-81-12; FHWA/IN/JHRP-81/12) Avail: NTIS HC A03/MF A01 CSCL 13C

The ASTM standard Superficial Rockwell hardness test using a 1/2 inch ball indenter and a 15 kgf Major Loar (15Y test) were adapted to perform nondestructive hardness tests on portland cement mortars and concrete. Correlations between the compressive strength of both materials and their hardnesses were found. The correlation for normal concrete and 3 x 6 inches compression cylinders is: 15Y hardness = 73.5 x (log compressive strength in psi) - 187 and has a correlation coefficient of 88 percent. The test can be performed on samples as thin as 2 mm, on surfaces with a radius of curvature no less than 2 cm and as close to a sample edge as 1 mm. The test uses a standard Rockwell Superficial hardness test instrument but requires a tungsten carbide indenting ball and a sufficiently large sample support to hold the size sample that is being tested. GRA

N82-21454# National Bureau of Standards, Washington, D.C. National Engineering Lab.
ENERGY MEASUREMENT IN THE STANDARD PENETRATION TEST Final Building Science Series Report
William D. Kovacs, Lawrence A. Salomone, and Felix Y. Yokel Aug. 1981 104 p refs
(PB82-132978; NBS-BSS-135; LC-81-600101) Avail: NTIS HC A06/MF A01 CSCL 13B

The standard penetration test, SPT is used in subsurface investigation for routine foundation designs. The routine foundation designs are accomplished by the use of SPT 'N' value. A field measurement system and procedure which measures the energy delivered by a drill rig system were developed and successfully used to study the factors which affect delivered energy. The energy delivered by certain drill rig systems used in engineering practice is indicated. Also, the transmission characteristics of certain hammer/anvil systems are examined. Guidance on the need to measure the actual fall height of the hammer during the standard penetration test is provided. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

N82-21455*# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
RESEARCH IN MILLIMETER WAVE TECHNIQUES Semiannual Status Report, Jul. - Dec. 1981
R. E. Forsythe Jan. 1982 42 p refs
(Grant NsG-5012; GT/EES Proj. A-1642)
(NASA-CR-168726; NAS 1.26:168726) Avail: NTIS HC A03/MF A01 CSCL 20N

Subharmonically pumped mixers were ascended and tested. A computerized version of the automatic noise figure measurement system was developed. Impedance matching techniques suitable for these types of mixers were investigated. Narrow and broadband (one octave) matching networks for the subharmonic mixers were designed. The automatic mixer noise figure test facility was completed. Subharmonic mixers and the systems that use them at 183 and 220 GHz were evaluated and characterized. N.W.

N82-21456*# New Mexico State Univ., Las Cruces.
SPEED-DEPENDENT COLLISION EFFECTS ON RADAR BACK-SCATTERING FROM THE IONOSPHERE Annual Report, 1 Sep. 1980 - 30 Nov. 1981
O. Theimer 30 Nov. 1981 17 p refs
(Grant NsG-7622)
(NASA-CR-168746; NAS 1.26:168746) Avail: NTIS HC A02/MF A01 CSCL 20N

A computer code to accurately compute the fluctuation spectrum for linearly speed dependent collision frequencies was developed. The effect of ignoring the speed dependence on the estimates of ionospheric parameters was determined. It is shown that disagreements between the rocket and the incoherent scatter estimates could be partially resolved if the correct speed dependence of the i-n collision frequency is not ignored. This problem is also relevant to the study of ionospheric irregularities in the auroral E-region and their effects on the radio communication with satellites. E.A.K.

N82-21457*# Business and Technological Systems, Inc., Seabrook, Md.
CONTEXT SENSITIVE FORMULATIONS OF ANTENNA PATTERN CORRECTION AND SIDE LOBE COMPENSATION FOR NOSS/LAMMR REAL TIME PROCESSING Final Report
Roland T. Chin and Paul R. Beaudet 7 Oct. 1981 157 p
(Contract NAS5-26541)
(NASA-CR-166789; NAS 1.26:166789; BTS-FR-81-165) Avail: NTIS HC A08/MF A01 CSCL 20N

Large antenna multi-channel microwave radiometer (LAMMR) software specifications were written for LAMMR ground processing. There is a need to determine more computationally-efficient antenna temperature correction methods in compensating side lobe contributions especially near continents, islands and weather fronts. One of the major conclusions was that the antenna pattern corrections (APC) processes did not accomplish the implied goals of compensating for the antenna side lobe influences on brightness temperature. A-priori knowledge of land/water locations was shown to be needed and had to be incorporated in a context sensitive APC process if the artifacts caused by land presence is to be avoided. The high temperatures in land regions can severely bias the lower ocean response. R.J.F.

N82-21458# European Space Agency, Paris (France).
SAR IMAGE QUALITY
Jun. 1981 96 p refs Presented at EARTHNET/EARSel Workshop, Frascati, Italy, 11-12 Dec. 1980
(ESA-SP-172; ISSN-0379-6566) Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 (US $12)

The processing and quality of synthetic aperture radar imagery is considered with particular attention on optimal multilook processing, simulation, beam tracking, speckle filtering, radiometric calibration, digital processing, ocean wave spectra, two-dimensional image spectrum, terrain models, etc. For individual titles, see N82-21459 through N82-21475.

N82-21459# European Space Research and Technology Center, Noordwijk (Netherlands). Data Handling and Signal Processing Div.
PURPOSE OF THE WORKSHOP: ADVANCES AND TRENDS IN THE SAR IMAGE QUALITY ASSESSMENT AREA
J. P. Guignard *In* ESA SAR Image Quality Jun. 1981 p 1-3 refs (For primary document see N82-21458 12-32)
Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 (US $12)

The state of the art in image quality assessment and, in particular, what knowledge has been gained using SEASAT SAR processors and/or images are considered. The current developments and/or issues are outlined. The identification of

image quality requirements when considering new applications and/or new products is discussed. Author (ESA)

N82-21460# MacDonald, Dettwiler and Associates Ltd., Richmond (British Columbia).
CONSIDERATIONS IN THE DESIGN OF OPTIMAL MULTI-LOOK PROCESSORS FOR IMAGE QUALITY
J. R. Bennett and P. R. McConnell *In* ESA SAR Image Quality Jun. 1981 p 5-12 refs (For primary document see N82-21458 12-32)
(Contract NRC-OSX-79-00078)
Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 (US $12)

The theory of speckle statistics is reviewed and predictions are tested with SEASAT SAR radar imagery. Agreement is good for visually uniform, distributed targets, but very poor for nonuniform areas. A method which uses measurements of the cross correlation coefficient between looks, in combination with the speckle model, to optimize the number and position of looks in any given processing task is presented. Author (ESA)

N82-21461# Centre National d'Etudes Spatiales, Toulouse (France).
SAR SIMULATION AT CNES: DESCRIPTION AND FIRST RESULTS
M. Dorrer *In* ESA SAR Image Quality Jun. 1981 p 13-16 (For primary document see N82-21458 12-32)
Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 (US $12)

A simulator for studying the influence of satellite parameters on radar image quality is presented. Azimuth ambiguities and quantization after analog range compression are investigated. A good tradeoff between speckle reduction and azimuth sidelobes is reported. A bidemensional histogram (probability of a given error for a given reference level) is recommended for the comparison of different noises or quantizers. Author (ESA)

N82-21462# Norwegian Defence Research Establishment, Kjeller.
SOME SAR PROCESSING RESULTS USING AUTO-FOCUSING
E.-A. Herland *In* ESA SAR Image Quality Jun. 1981 p 19-22 (For primary document see N82-21458 12-32)
Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 (US $12)

A digital SAR processor developed to produce images from SAR raw data is described. A method for obtaining automatic focusing in azimuth compression is presented with a discussion of inherent limitations. Examples of processed imagery are shown. Results for land areas are good. A combination of estimation of orbit parameters from SAR raw data and externally supplied orbit data provides the information necessary for image processing. Distortions in the data can be corrected by using maximum contrast. Author (ESA)

N82-21463# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
SAR PROCESSOR SIGNATURE VARIATIONS TO POINT SOURCE INPUTS
A. D. Goldfinger *In* ESA SAR Image Quality Jun. 1981 p 23-27 ref Sponsored by Canadian Center for Remote Sensing (For primary document see N82-21458 12-32)
Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 (US $12)

Overall SAR system performance is studied in a manner that allows instrument effects to be separated from processor effects. Images are analyzed to determine point target signatures and radiometric response characteristics. Processors and methods considered are: the Jet Propulsion Laboratory (JPL) optical, JPL digital. Environmental Research Institute of Michigan (ERIM) hybrid (i.e. optical with digital readout), ERIM optical, and MacDonald Dettwiler and Associates Ltd (MDA) digital. Significant variability is reported in the quality and nature of imaging output among the processors. Evidence of saturation is seen in all processor outputs, but the MDA digital is most linear. Author (ESA)

N82-21464# Joint Research Centre of the European Communities, Ispra (Italy).
METHODS FOR SPECKLE FILTERING
W. Mehl *In* ESA SAR Image Quality Jun. 1981 p 29-31 refs (For primary document see N82-21458 12-32)
Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 (US $12)

Adaptive filters, to aid in the detection of boundaries and segmentation of imagery into homogenous areas, are studied. Distance from center adaption, adaption through reordering and fitting plane gradient adaption, are treated. A series of filters were tested over an agricultural area. They all smoothed homogenous areas while preserving sharp borders. Computational measurement of performance cannot be achieved by pure image processing methods independent of a given application. Author (ESA)

N82-21465# GEC-Marconi Electronics Ltd., Chelmsford (England). Research Labs.
MEASUREMENT OF RADIOMETRIC CRITERIA
P. F. Miller *In* ESA SAR Image Quality Jun. 1981 p 33-40 ref (For primary document see N82-21458 12-32)
Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 (US $12)

An approach to the automatic measurement of radiometric resolution in an arbitrary sample of SAR imagery is described and the results of applying it to selected imagery are presented. A uniform distributed target is simulated by removing all pictorial content, leaving pure speckle. A spread of answers, below and above theoretical predictions, results. Author (ESA)

N82-21466# European Space Agency, Toulouse (France). Remote Sensing Programme Div.
SAR IMAGE QUALITY REQUIREMENTS FOR RADIOMETRIC CALIBRATION
A. Haskell *In its* SAR Image Quality Jun. 1981 p 41-43 (For primary document see N82-21458 12-32)
Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 (US $12)

The impact of the need for calibration on image quality specifications is discussed. Considerations of the image quality requirements for calibration indicate conflict with image quality requirements for other purposes. These conflicts may lead to different concepts of space segment design whereas others may lead to a ground segment (e.g. SAR processor) with separate modes for calibrated and uncalibrated products. Author (ESA)

N82-21467# Mitsubishi Electric Corp., Kamakura (Japan).
DIGITAL PROCESSING OF SEASAT SAR DATA USING CRAY-1
M. Ono, Y. Matsui, T. Kirimoto, S. Kuzuoka, K. Shiramatsu, and T. Takeshita *In* ESA SAR Image Quality Jun. 1981 p 45-46 (For primary document see N82-21458 12-32)
Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 (US $12)

Digital processing on CRAY-1, a very high speed array processor, was performed and processing time was evaluated, which shows enough speed for the processing of satellite-borne SAR data. Processing time for an area of 100 km by 100 km is 30 minutes. Software is presented, written with FORTRAN for IBM 370/168 and partially vectorized for use with CRAY-1. Author (ESA)

N82-21468# Nippon Electric Co. Ltd., Tokyo (Japan).
DIGITAL PROCESSING OF SPACEBORNE SYNTHETIC APERTURE RADAR DATA
H. Nohmi, N. Ito, and S. Hanaki *In* ESA SAR Image Quality Jun. 1981 p 47-49 ref (For primary document see N82-21458 12-32)
Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 (US $12)

The digital processing of SEASAT synthetic aperture imagery using a general purpose computer is discussed and a system using a special purpose high speed processor is described. This template controlled image processor (TIP) is based on data driven philosophy and focuses on pipeline techniques for speeding up the process. To gain greater processing capabilities, the stacking of TIP units and an SAR image reconstruction flow diagram for this parallel processing are envisioned. Author (ESA)

N82-21469# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
TWO-DIMENSIONAL POWER SPECTRA OF SEASAT SAR IMAGERY
H. Seichter *In* ESA SAR Image Quality Jun. 1981 p 55-58 (For primary document see N82-21458 12-32)
Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 (US $12)

A least complication attempt was made to produce ocean wave power spectra of SEASAT SAR imagery. Two-dimensional

power spectra of ocean SAR imagery with a pixel spacing of 12.5 m or multiples of it and side lengths of 1.6 km to 25.6 km were produced and converted to photo products. The most favorable sizes are dependent on wave properties. Author (ESA)

N82-21470*# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
OPTIMAL SPATIAL FILTERING AND TRANSFER FUNCTION FOR SAR OCEAN WAVE SPECTRA
R. C. Beal and D. G. Tilley *In* ESA SAR Image Quality Jun. 1981 p 59-65 refs Sponsored in cooperation with NOAA and NASA (For primary document see N82-21458 12-32)
(Contract MO-A01-7800-4330)
Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 (US $12)

The impulse response of the SAR system is not a delta function and the spectra represent the product of the underlying image spectrum with the transform of the impulse response which must be removed. A digitally computed spectrum of SEASAT imagery of the Atlantic Ocean east of Cape Hatteras was smoothed with a 5 x 5 convolution filter and the trend was sampled in a direction normal to the predominant wave direction. This yielded a transform of a noise-like process. The smoothed value of this trend is the transform of the impulse response. This trend is fit with either a second- or fourth-order polynomial which is then used to correct the entire spectrum. A 16 x 16 smoothing of the spectrum shows the presence of two distinct swells. Correction of the effects of speckle is effected by the subtraction of a bias from the spectrum. A.R.H.

N82-21471# Canada Centre for Remote Sensing, Ottawa (Ontario).
SAR RESPONSE TO UNIFORM RANDOM SCENES
R. K. Raney *In* ESA SAR Image Quality Jun. 1981 p 67-70 refs (For primary document see N82-21458 12-32)
Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 (US $12)

In order to establish sensitivity of SAR/processor response to resolution/look tradeoff, possible focus error, and filter envelope functions; and to describe spectral/correlation properties caused by the system so that spectral properties due to the scene may be observed, 1st and 2nd order statistics are derived for SAR output with (1) uniform (Gaussian) distributed input, (2) minimum restraints on SAR and processor; and (3) general multilook case. An output correlation function is found to be necessary to fully describe the system, together with impulse response. Author (ESA)

N82-21472# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A DERIVATION OF THE STATISTICAL CHARACTERISTICS OF SAR IMAGERY DATA
C. Wu *In* ESA SAR Image Quality Jun. 1981 p 71-75 refs (For primary document see N82-21458 12-32)
(Contract NAS7-100)
Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 (US $12)

Basic statistical properties of the speckle effect and the associated spatial correlation of SAR image data are discussed. Statistics of SAR sensed measurement and their relationships to the surface mean power reflectivity are derived. The Rayleigh speckle model is reviewed. Applications of the derived statistics to SAR radiometric measures and image processing are considered. Author (ESA)

N82-21473# Max-Planck-Institut fuer Meteorologie, Hamburg (West Germany).
A NUMERICAL TEST OF THE SIFT ALGORITHM
S. Scheffler *In* ESA SAR Image Quality Jun. 1981 p 77-79 refs (For primary document see N82-21458 12-32)
Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 (US $12)

The evaluation of ocean wave spectra from SAR signal data investigated. The different approaches, conventional processing, SIFT algorithm, and the similar autocorrelation method are discussed and tested on a one dimensional example with simulated raw data. Motion effects of the ocean waves are neglected. The main advantage of the algorithm is that it is separable with respect to wavenumber, and spectral values can therefore be calculated using only a few chosen components. Author (ESA)

N82-21474# Centre de Recherches en Physique de l'Environnement, Issy-les-Moulineaux (France).
DIRECT DETERMINATION OF THE TWO DIMENSIONAL IMAGE SPECTRUM FROM RAW SYNTHETIC APERTURE RADAR DATA
P. Martin *In* ESA SAR Image Quality Jun. 1981 p 81-87 refs Submitted for publication (For primary document see N82-21458 12-32)
Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 (US $12)

An algorithm is described which computes the two-dimensional Fourier transform of a synthetic aperture radar image. This method is intended to replace the whole SAR processing and the two-dimensional Fourier transformation by a specialized processing scheme which, in terms of computational speed and complexity, will be of the order of a single two-dimensional autocorrelation. This processing approach is applied to the estimation of the wave directional spectrum from the raw data of the SAR sensor of SEASAT-1. Author (ESA)

N82-21475# Canada Centre for Remote Sensing, Ottawa (Ontario).
RELIEF EFFECTS AND THE USE OF TERRAIN MODELS IN SAR IMAGE PROCESSING
B. Guindon, P. M. Teillet, D. G. Goodenough, K. Dickinson (INTERA Environmental Consultants, Calgary, Canada), and J. F. Meunier (INTERA Environmental Consultants, Calgary, Canada) *In* ESA SAR Image Quality Jun. 1981 p 89-92 refs (For primary document see N82-21458 12-32)
Avail: NTIS HC A05/MF A01; ESA, Paris FF 55 (US $12)

The use of digital terrain models in Canada to overcome the effects of topographic relief on geometric and radiometric fidelity of SAR imagery is discussed. Digital elevation models (DEM) can reduce, to 15 m, errors incurred in overlaying multipass SAR imagery of mountainous terrain. Neglect of topography can result in errors of hundreds of meters. Shadow or layover problem areas can be identified using DEM's. Author (ESA)

N82-21476# TRW Defense and Space Systems Group, Redondo Beach, Calif. Communications Systems Lab.
EVALUATION OF DCS 3 TRANSMISSION ALTERNATIVES, PHASE 2, TASK 1 Final Report
T. M. Chu, D. L. Segel, S. H. Lin, C. Y. Yoon, and R. A. Pickens 31 Aug. 1981 177 p refs Prepared in cooperation with Page Communications Engineers, Inc., Washington, D.C. 3 Vol.
(Contract DCA100-79-C-0044)
(AD-A109840) Avail: NTIS HC A09/MF A01 CSCL 17/2

This report is one of a series that document the study, analysis, and evaluation of the use of advanced communications technology in the Defense Communications System. The purpose of the overall study was to project the capability of potential transmission media into the future, and to assess their comparative utility for DCS application in the years 2000 and beyond. This phase and task of the study focused on the results of Phase I, which indicated the greatest potential was in application of millimeter wave LOS radio and in fiber optic transmission. This report contains the design of DCS network alternatives using these media in Central Germany and in Hawaii. Author (GRA)

N82-21477# TRW Defense and Space Systems Group, Redondo Beach, Calif. Communications Systems Lab.
EVALUATION OF DCS 3 TRANSMISSION ALTERNATIVES, PHASE 2, TASK 2 Final Report
T. M. Chu, D. L. Segel, S. H. Lin, C. Y. Yoon, and R. A. Pickens 16 Nov. 1981 278 p refs Prepared in cooperation with Page Communications Engineers, Inc., Washington, D.C. 3 Vol.
(Contract DCA100-79-C-0044)
(AD-A109841) Avail: NTIS HC A13/MF A01 CSCL 17/2

This report is the final of a series that document the study, analysis, and evaluation of the use of advanced communications technology in the Defense Communications System. The purpose of the overall study was to project the capability of potential transmission media into the future, and to assess their comparative utility for DSC application in the years 2000 and beyond. The final phase of the study contained in this report addresses the use of millimeter wave LOS radio and fiber optic transmission in central Germany and Hawaii. The system performance was modeled using the parameter of 'Average Network Availability'. Network cost and performance was evaluated for a number of

different configurations, and under a variety of stress conditions.
Author (GRA)

N82-21478# TRW Defense and Space Systems Group, Redondo Beach, Calif. Communications Systems Lab.
EVALUATION OF DCS 3 TRANSMISSION ALTERNATIVES, PHASE 2, TASK 1. APPENDIX. PATH PROFILES Final Report
T. M. Chu, S. H. Lin, D. L. Segel, and C. Y. Yoon 31 Aug. 1981 179 p Prepared in cooperation with Page Communications Engineers, Inc., Washington, D.C. 3 Vol.
(Contract DCA100-79-C-0044)
(AD-A109842) Avail: NTIS HC A09/MF A01 CSCL 17/2

This appendix presents all the line-of-sight path profiles for transmission alternatives proposed for Oahu Island, Hawaii and Central Germany. The path profiles are listed alphabetically according to locations of transmitting and receiving sites. Related information, such as latitude, longitude, elevation and antenna tower height of each terminal are provided for each profile. If the same link path is used for both microwave LOS and millimeter wave LOS system, then one path profile is provided appearing in the microwave path profiles section. GRA

N82-21479# Berkeley Research Associates, Inc., Calif.
PHASE EFFECTS OF IONOSPHERIC IRREGULARITIES. RESULTS OF THE AIR FORCE WRIGHT AERONAUTICAL DATA PROCESSING EFFORT Final Report, 1 Jan. 1979 - 31 Jul. 1981
Clifford W. Prettie Wright-Patterson AFB, Ohio AFWAL Sep. 1981 95 p refs
(Contract DNA001-79-C-0141; AF Proj. 1227)
(AD-A110290; PD-BRA-81-244R; AFWAL-TR-81-1163) Avail: NTIS HC A05/MF A01 CSCL 20/14

Data processing of Air Force Wright Aeronautical Laboratory flight test satellite signal measurements has been performed to illustrate the phase effects associated with ionospheric irregularities. Measurements are available at 250 MHz satellite signals traversing ionospheric heating induced irregularities, barium ion cloud irregularities, and polar and equatorial irregularities. For each of these environments displays of amplitude, phase difference standard deviation, phase difference histograms and phase power spectral density are given. The results of ionospheric heating measurements imply that underdense heating produces large scale irregularities with fluctuation levels that are conceivably larger than overdense heating fluctuations. The barium measurements from the CASTOR releases by Max Planck Institute in March 1979 near Peru show no barium associated phase effects. Because of the 275 km release altitude it is expected that the associated phase effects should be difficult to resolve. The phase difference histograms from the strong fading observed in the solar and equatorial measurements illustrate the importance of the non-Gaussian nature of the phase to communications. Binary phase-shift keyed (BPSK) irreducible error rates greater then minus ten to the 3rd power are predicted for these environments based upon their similarity with band-limited Gaussian noise.
Author (GRA)

N82-21480# Environmental Research Inst. of Michigan, Ann Arbor. Radar and Optics Div.
ITERATIVE FOURIER SYNTHESIS TECHNIQUES FOR REFLECTION GRATINGS AND CORRUGATED WAVEGUIDE FILTERS Final Scientific Report, 1 Feb. - 30 Sep. 1981
K. A. Winick Oct. 1981 68 p refs
(Contract F49620-81-C-0029; AF Proj. 2305)
(AD-A110428; ERIM-153900-1-F; AFOSR-82-0016TR) Avail: NTIS HC A04/MF A01 CSCL 09/1

In the first section, the accuracy of coupled mode theory as applied to volume, dielectric reflection gratings which have unslanted fringes and either periodic or aperiodic refractive index profiles is investigated. The accuracy is evaluated by comparing coupled mode theory results with those obtained by Abeles' exact multilayer theory. For the examples considered, coupled mode theory gave accurate results only for gratings having periodic refractive index profiles. In Section 2, a method for designing volume, dielectric, reflection gratings having unslanted fringes is developed. The technique is applicable to two types of problems. The first type is one in which the reflectance, R, vs. angle of incidence and wavelength is specified, and the second type is one in which the amplitude reflection and transmission coefficients, r and t, respectively, vs. angle of incidence and wavelength are specified. In both cases, the technique determines (approximately) the corresponding one dimensional refractive index profile, n(z). The synthesis method is illustrated by two examples, and for these examples, the method is seen to be reasonably accurate. In Section 3, a formal mathematical analogy between reflection gratings and corrugated waveguide filters (CWF) is demonstrated. The possibility of designing CWF, using the iterative Fourier transform technique developed in Section 2, is explored. It is emphasized that the mathematics developed for CWF is not rigorous. Consequently, predicted results should be experimentally verified and attempts should be made to develop a rigorous mathematical approach. GRA

N82-21481# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DANGEROUS ELECTRIC WAVES
Feng Xiancheng 6 Jan. 1982 9 p Transl. into ENGLISH from Hangkong Zhishi (China), no. 4, Apr. 1981 p 8-9
(AD-A110283; FTD-ID(RS)T-0891-81) Avail: NTIS HC A02/MF A01 CSCL 19/5

The use of radar in aerial warfare is discussed. Electronic countermeasures are also described. L.F.M.

N82-21482# Syracuse Univ., N. Y. Dept. of Electrical and Computer Engineering.
COMPUTER PROGRAM FOR ELECTROMAGNETIC COUPLING TO A CONDUCTING BODY OF REVOLUTION WITH HOMOGENEOUS MATERIAL REGION
Joseph R. Mautz and Roger F. Harrington Griffiss AFB, N.Y. RADC Oct. 1981 73 p refs
(Contract F30602-79-C-0011; AF Proj. 2338)
(AD-A110385; RADC-TR-81-297) Avail: NTIS HC A04/MF A01 CSCL 20/14

A computer program is given to calculate electromagnetic coupling to a perfectly conducting body of revolution with a loss-free homogeneous material region. The material region is also a body of revolution. It is bounded by an aperture and part of the surface of the conducting body. The maximum dimensions of the conducting body and its associated material region are of the order of a few wavelengths. The electromagnetic excitation is an obliquely incident theta-polarized plane wave. Application of the equivalence principle and subsequent enforcement of the boundary conditions for tangential fields give a set of integral equations. These equations are then solved by means of the method of moments. The computer program calculates the electric current induced on the surface of the conducting body and the equivalent electric and magnetic currents in the aperture. These currents radiate the field scattered by the conducting body and its associated material region. They also radiate the field transmitted through the aperture into the material region. The computer program is described and listed along with sample input and output data. Author (GRA)

N82-21483# Naval Air Systems Command, Washington, D. C.
CONFORMAL ANTENNA ARRAY DESIGN HANDBOOK
R. C. Hansen, ed., P. T. Bargeliotes, J. Boersma, Z. W. Chang, K. E. Golden, A. Hessel, W. H. Kummer, R. Mather, H. E. Mueller, and D. C. Pridmore-Brown Sep. 1981 440 p refs
(AD-A110091) Avail: NTIS HC A19/MF A01 CSCL 09/5

A discussion of conformal antenna arrays is divided in the following three categories: low gain antennas for small missiles and artillery rounds; fuselage mounted ECM arrays for aircraft; and electronically scanned arrays covering wide angles. Conforming the array to the surface not only saves space and allows rapid inertialess scan but often is essential for structural reasons. L.F.M.

N82-21484# Michigan Univ., Ann Arbor. Radiation Lab.
FUNCTION-THEORETIC TECHNIQUES FOR THE ELECTROMAGNETIC SCATTERING BY A RESISTIVE WEDGE
Ivan Joseph LaHaie Sep. 1981 144 p refs
(Grant AF-AFOSR-3188-77; AF Proj. 2304)
(AD-A110182; Rept-015224-2-T; TR-2; AFOSR-81-0869TR) Avail: NTIS HC A07/MF A01 CSCL 20/3

Function theoretic techniques successful in solving electromagnetic scattering problems involving wedges satisfying an

impedance boundary condition area was used to formulate the scattering by a wedge composed of two resistive sheets. The possibility of generalizing the techniques to a two region problem, characterized by nonzero fields in both the interior and exterior of the wedge was considered. The particular techniques considered were the method of Maliuzhinets' and the Kontorovich-Lebedev transform, both involving integral representations for the unknown fields, and generation of functional equations for the transformed unknown. It was shown that for the resistive wedge, the presence of an interior field results in functional equations of considerably greater complexity than those encountered in similar single region problems. A procedure which replaces the functional equations with integral equations of the Fredholm type was developed. An approximate solution was obtained which consists of a power series. Its resistivity and bounds for its region of convergence are given. GRA

N82-21485# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ANTENNY (SELECTED ARTICLES)

S. M. Verevkin, I. P. Ivanov, B. A. Poperechenko, I. V. Vavilova, V. M. Golovachev, A. A. Kuzmin, I. V. Guzeyev, and A. V. Kolot 14 Jan. 1982 60 p refs Transl. into ENGLISH from Antenny (USSR), no. 5, 1969 p 61-107

(AD-A110318; FTD-ID(RS)T-1091-81) Avail: NTIS HC A04/MF A01 CSCL 09/5

Selected articles on antennas are presented. The following topics are discussed: (1) optimization of main radio engineering characteristics of highly efficient low noise antennas; (2) designing a correcting mirror in two mirror antennas of circular symmetry; (3) shaping the radiation pattern of arc antennas; (4) energy characteristics of periodic systems of emitters. E.A.K.

N82-21486# Mitre Corp., Bedford, Mass.

AN ALGORITHM SCHEMA FOR MINIMIZING BROADCAST TRANSMISSIONS IN PACKET RADIO NETWORKS

Bahaa W. Fam Dec. 1981 50 p refs

(Contract F19628-81-C-0001; AF Proj. 8280)

(AD-A110218; MTR-8384; ESD-TR-81-388) Avail: NTIS HC A03/MF A01 CSCL 17/2

In packet radio networks the broadcasting subnetwork required to reach a community of users can be substantially reduced through the algorithm schema presented. The algorithms given minimize the number of relay transmissions required to reach a given group of users in a broadcast network structure. The subnetwork produced by the algorithm schema also has the characteristic of minimizing the relay data to any user in the group. One algorithm gives a solution to the minimal cover problem (optimal except for a specific class of counterexamples) in polynomial time. Existing optimal algorithms are exponentially bounded in complexity. Author (GRA)

N82-21487# Motorola, Inc., Tempe, Ariz. Government Electronics Div.

BATCH COVARIANCE RELAXATION (BCR) ADAPTIVE PROCESSING Final Technical Report, Dec. 1979 - Mar. 1981

S. M. Daniel and I. Ketesz Griffiss AFB, N.Y. RADC Aug. 1981 649 p refs

(Contract F30602-80-C-0031; AF Proj. 4506)

(AD-A109927; Rept-8512-F; RADC-TR-81-212) Avail: NTIS HC A99/MF A01 CSCL 20/14

The objective of this program was to develop a systematic method of generating adaptive weights through the application of the Batch Covariance Relaxation (BCR) algorithm and assess the performance of such weights in an adaptive sidelobe canceller system. GRA

N82-21488# Forschungsinstitut fuer Hochfrequenzphysik, Werthhoven (West Germany).

SIDELOBE FORMING OF THE PATTERN OF ARRAY ANTENNAS [NEBENKEULENFORMUNG DER RICHTCHARAKTERISTIK VON GRUFFENANTENNEN]

I. Groeger Dec. 1979 89 p refs In GERMAN; ENGLISH summary

(FFM-290) Avail: NTIS HC A05/MF A01

A weighting function for gain maximization, with a reduced sidelobe, in given solid angles of an array antenna pattern is defined and interpreted. The theoretical possibility of an antenna array for which the complex excitations of the individual antenna elements are controlled is demonstrated. A transformation matrix for solid angle operation with constant additional damping is evaluated for the characteristic optimal sidelobe. An eigenvector analysis is posed, and mean values for sidelobe damping are determined which maximize directivity. Suboptimum sidelobe forming methods with estimated vectors are then considered due to reduced implementation costs. Author (ESA)

N82-21489# Royal Aircraft Establishment, Farnborough (England). Radio and Navigation Dept.

A PRACTICAL GUIDE TO THE DESIGN AND CONSTRUCTION OF A SINGLE WIRE BEVERAGE ANTENNA

H. L. Spong London HMSO Sep. 1980 33 p refs

(RAE-TM-RAD-NAV-137; BR76127) Avail: NTIS HC A03/MF A01

Theoretical results are presented which show the performance likely to result from using differing antenna heights, lengths and wire sizes and from operating with different ground conductivities. These studies were undertaken to provide practical advice for constructors and operators. Design parameters can be easily obtained with the aid of computer programs and an antenna can be rapidly constructed from readily available materials. Directivity can be increased by adding more elements, either in parallel or on a radial basis. A particular performance can be achieved with great latitude in the parameters. Good low angle performance can be achieved without large ground screens. A directional array can be made by switching between a number of elements set up on different bearings. Author (ESA)

N82-21490# Royal Signals and Radar Establishment, Malvern (England).

AN EFFICIENT ITERATIVE METHOD FOR THE COMPUTER SOLUTION OF LARGE SETS OF SIMULTANEOUS LINEAR EQUATIONS APPLIED TO ANTENNA MODELING

T. E. Hodgetts London Nov. 1979 23 p refs

(RSRE-Memo-3237; BR75641) Avail: NTIS HC A02/MF A01

Boundary value problems in field theory, including those of electromagnetic radiation from antennas, are briefly discussed. They are often expressed in the form of linear integral equations which in turn can be reduced to a fully determined set of linear simultaneous equations. Very large sets of simultaneous linear equations can usually be solved to reasonable accuracy more quickly by an iterative method than by a direct one, but most iterative methods only converge if the elements of the principal diagonal of the coefficient matrix dominate all the other elements. An iterative method which depends for its convergence only on dominance by the elements of an arbitrarily wide band of diagonals centered on the principal diagonal is described. The theory of the method is fully worked out, and a computer program implementing it in FORTRAN IV. Author (ESA)

N82-21491# Research Inst. of National Defence, Stockholm (Sweden).

THE COM TELECONFERENCING SYSTEM FUNCTIONAL SPECIFICATION

Jacob Palme, Stefan Arnborg, Lars Enderin, Carl Meyer, and Torgny Tholerus Nov. 1980 115 p Revised

(FOA-C-10164-M6(H9)-Rev) Avail: NTIS HC A06/MF A01

A detailed functional specification of a computerized teleconferencing system is presented. The system is based on the existing teleconferencing system COM on the DEC system 10 computer, with cetain additions of facilities not yet ready in the present version of the DEC system 10 system. An efficient and portable system which handles up to 2000 users and conferences is called for. The human computer interface is designed for easy use. The specifications are prepared for use when procuring a new, minicomputer based and portable computerized teleconferencing system. Author (ESA)

N82-21492# Royal Signals and Radar Establishment, Malvern (England).

A COMPOUND REPRESENTATION OF HIGH RESOLUTION SEA CLUTTER

K. D. Ward Sep. 1980 12 p refs

(RSRE-Memo-3274; BR77043) Avail: NTIS

HC A02/MF A01

Measurements of sea clutter at low grazing angles using high resolution radar show that the probability density function, p(x), of envelope detected clutter is not Rayleigh. Based on time averaged sea clutter recordings, a compound form of p(x) is proposed leading to the K distribution for the overall p(x). This model is then used to explain both the non Rayleigh nature of the clutter and also the correlation properties for fixed frequency and frequency agile radar returns. Illustrations are given of applications to signal processing performance calculations along with some results for a fixed threshold. Author (ESA)

N82-21493# Royal Signals and Radar Establishment, Malvern (England).

A SYSTEM FOR THE PROCESSING, TRANSMISSION AND REMOTE DISPLAY OF DATA FROM A WEATHER RADAR

A. P. Ball, J. L. Clarke, B. D. Davy, M. J. Brien, S. E. Strigg, B. C. Taylor, and T. A. Voller 1980 41 p refs Original contains color illustrations

(RSRE-Memo-3020; BR58207) Avail: NTIS HC A03/MF A01

A computer based real time processor was built to provide digitized data on precipitation intensity within 100 km of the radar and qualitative data out to 200 km from the radar. The data can be made available in a form suitable for further computer processing or for logging or as a display in up to seven intensity (color) levels on a modified color television. Following each radar transmission, the aerial receives data from an azimuthal sector of space. The analog video train from the radar is digitized in the 8 bit analog to digital converter which samples approximately once per radar pulse length. Thus the digitizer effectively gates the sector into a very large number of range cells (typical length 200 m). The digitized radar signals are integrated in range by a programmable hardware avenger. A technique for clutter discrimination is described, using discrimination by fluctuation rate. Data formats and simplified circuit diagrams are shown. Author (ESA)

N82-21494# Fernmeldetechnisches Zentralamt, Darmstadt (West Germany). Forschungsinst.

OPTIMAL INVESTMENTS IN DIGITAL COMMUNICATION SYSTEMS IN PRIMARY EXCHANGE AREA [OPTIMALE INVESTIONEN DIGITALER UEBERTRAGUNGSSYSTEME IN EINEM KVSt-BEREICH]

Raymond Garcia and Roland Hornung Nov. 1980 15 p refs In GERMAN; ENGLISH summary

(Rept-44-TBr-83) Avail: NTIS HC A02/MF A01

Integer linear optimization theory, following Gomory's method, was applied to the model planning of telecommunication networks in which all future investments are made in digital systems only. The integer decision variables are the number of digital systems set up on cable or radiorelay links that can be installed. The objective function is the total cost of the extension of the existing line capacity to meet the demand between primary and local exchanges. Traffic volume constraints and flow conservation in transit nodes complete the model. Results indicating computing time and method efficiency are illustrated by an example. Author (ESA)

N82-21495# Fernmeldetechnisches Zentralamt, Darmstadt (West Germany). Forschungsinst.

OCCURENCE PROBABILITY OF MULTIPLE BIT ERRORS IN DIGITAL LINE SYSTEMS WITH MMS43 BLOCK CODES

Guenter Morgenstern Feb. 1981 32 p refs In GERMAN; ENGLISH summary

(Rept-44-TBr-84) Avail: NTIS HC A03/MF A01

Probabilities were calculated for the transmission of a signal which is a pure random sequence. The calculation is indicated to be also applicable to other block codes and to other scramblers and descramblers. Results with and without scramblers are compiled in tables, the application of which is illustrated by examples. Author (ESA)

N82-21496# Forschungsinstitut fuer Hochfrequenzphysik, Werthhoven (West Germany).

INVESTIGATIONS ON THE SINGULARITY EXPANSION METHOD FOR ELECTROMAGNETIC FIELDS

E. Ludwig and C. vonWinterfeld Oct. 1980 26 p refs In GERMAN; ENGLISH summary

(Contract BMVg-GF-80)

(Rept-9/80) Avail: NTIS HC A03/MF A01

The electromagnetic field of antennas and scatterers is represented by a Laurent series. A numerical method, singularities expansion method (SEM), is discussed which extracts the corresponding singularities of the first order from measured field values in the frequency domain. The SEM expansion is applied to a simple scatterer (a metallic sphere) the scattered field of which can be calculated by conventional methods and to the measured reflected field values of a sphere and circular disk. Results show good agreement between the values obtained. Author (ESA)

N82-21497# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computer Science.

ENHANCEMENT OF TELETEX PROCEDURES TO INCORPORATE ENCIPHERMENT AND SIGNATURES

D. W. Davies Apr. 1981 21 p refs

(NPL-DNACS-42/81; ISSN-0143-7348) Avail: NTIS HC A02/MF A01

A method of applying U.S. Data Encryption Standard encipherment to Teletex is described. The possibility of encipherment at the session level, the mode of encipherment, and the extent of the cryptographic chain are considered. The establishment of a new key and initialization variable for each session is recommended, and three alternative methods for key distribution are described. The sequence of events in a successful session, including enciphered documents, is given. Other considerations are encipherment parameters and signature procedures. Author (ESA)

N82-21498# Centre Technique des Industries Mecaniques, Senlis (France).

CALCULATION STANDARDS FOR CORRUGATED, DILATING BELLOWS. PRESSURE APPARATUS (FRENCH) CODE OF STANDARDS Final Report [REGLES DE CALCUL DES SOUFFLETS DE DILATATION A ONDES EN 'U' POUR LE CODE FRANCAIS DES APPAREILS A PRESSION]

F. Osweiller 5 Nov. 1980 40 p In FRENCH

(CETIM-14B081) Avail: NTIS HC A03/MF A01

Rules are presented for determining the minimum wall thickness of dilating bellows of accordian construction, number of expansion cycles the equipment can tolerate, and acceptable pressure variations. Two calculation methods are used. The first is an elasticity analysis, based on thin shell theory, which determines constraints due to pressure and axial displacement. These constraints are combined in order to derive an equivalent fatique constraint. The second makes use of experimentally compiled fatigue curves in order to determine an acceptable number of fatigue cycles. When the cycles analyzed are not all identical the Miner rule is applied, calculating cumulative damage. Author (ESA)

N82-21499# Royal Signals and Radar Establishment, Malvern (England).

THE DESIGN AND IMPLEMENTATION OF AN OPERATIONAL, COMPUTER-BASED WEATHER RADAR SYSTEM

A. P. Ball, J. L. Clarke, M. J. Brien, A. H. Shaw, S. E. Trigg, and T. A. Voller 1979 94 p refs Original contains color illustrations

(RSRE-MEMO-3151; BR71459) Avail: NTIS HC A05/MF A01

A system that provides quantitative rainfall data is described. It consists of an on-site PDP-11/40 computer used to process digitized radar data from a narrow beam, fully steerable radar aerial. The data are collected at several low elevation angles. The radar amplitude signals received are digitized and transferred to the computer by a special purpose radar signal averaging unit (RSAU). After processing, the signals are displayed as a color coded, Cartesian map of instantaneous rainfall rate and distribution on a modified color TV via a special data store. Similar data can be transmitted via the DATEL service to users remote from the radar and to a network center computer where a composited color TV picture of data is displayed. Hardware and software are described in detail. Author (ESA)

N82-21500# Royal Aircraft Establishment, Farnborough (England).
SIMPLE METHODS FOR CALCULATING THE AZIMUTHAL COVERAGE OF HIGH FREQUENCY DIRECTIONAL ANTENNAS
G. May Feb. 1981 27 p refs
(REA-TR-81018; REA-Rad-Nav-104; BR78128) Avail: NTIS HC A03/MF A01

Spherical trigonometry formulas employing auxiliary quantities because of their suitability for use with hand held electronic calculators are emphasized. The relationships between sides and angles of oblique spherical triangles are listed, and the value of applying tests based on these relationships prior to making detailed solutions of spherical triangle problems is demonstrated. Various approaches to obtaining great circle distances and bearings are examined, and the advantage of the auxiliary quantities method when using an electronic calculator are shown. Author (ESA)

N82-21501# European Space Agency, Paris (France).
VIDEO TELECONFERENCE BY SATELLITE. COMPARISON OF MEETING STRUCTURE AND SATELLITE SYSTEM DESIGN
S. E. Dinwiddy (ESTEC, Noordwijk, Netherlands) and W. R. Burke, ed. Jun. 1981 20 p refs
(ESA-STM-220; ISSN-0379-4075) Avail: NTIS HC A02/MF A01

The forms of direct contact experienced in real meetings and the forms of remote contact experienced in teleconference meetings are discussed. Two types of meeting, round table and forum, are identified and the impact of the size of the meetings on the way in which they are conducted and on their communications requirements is related to the teleconference studio design and the satellite network requirements. Author (ESA)

N82-21502# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelning 3.
COMPARATIVE ANTENNA MEASUREMENT IN REAL ENVIRONMENT: 30-80 MHz ANTENNAS IN WOODED AREAS
Folke Land, Boerje Asp, Lars Ladell, and Stellan Nilsson Jun. 1981 53 p refs Original contains Color illustrations
(FOA-C-30222-E2) Avail: NTIS HC A04/MF A01

Comparative antenna measurements were carried out with different types of antennas, such as whip, Scoobydo, longwire, Haller, disk cone and vehicle mounted antennas, for the frequency region 30 to 80 MHz. The antennas were mounted at seven different places in a wooded environment. At five of these antenna sites five antennas were mounted, and at the other two sites there were two and three antennas, respectively. The measurements were performed with the frequencies 38 and 66 MHz. At the antenna site with only two antennas, only 42 MHz was used. Only results from the measurement and facts about the measurements are given. J.M.S.

N82-21503# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriersbereich.
TECHNICAL AND ORGANIZATIONAL SOLUTIONS TO PROBLEMS OF ELECTROMAGNETIC COMPATIBILITY POSED BY THE DEVELOPMENT OF THE TRANSRAPID TEST FACILITY, ENGLAND [FACHLICHE UND ORGANISATORISCHE LOESUNGSANSAETZE ZU PROBLEMSTELLUNGEN DER ELEKTROMAGNETISCHEN VERTRAEGLICHKEIT BEI DER ENTWICKLUNG DER TRANSRAPID VERSUCHSANLAGE EMSLAND]
Wolf-Dieter Pilz and Peter Ferger 8 Sep. 1981 5 p In GERMAN
(MBB-UR-506/81-OE) Avail: NTIS HC A02/MF A01

Disadvantages of magnetic levitation technology related to a transportation system network, linking a metropolitan center with outlying regions are enumerated. Further development of an energy efficient, high speed system for long distance travel necessitates prevention of possible electromagnetic hazards. Lightning generation by the charged components of the system, like swept stroke phenomena is treated. Electrostatic interference from the system is noted and further developments are required to exploit high speed potential. Author (ESA)

N82-21504# Institute for Telecommunication Sciences, Boulder, Colo.
HF CHANNEL-SIMULATOR MEASUREMENTS ON THE KY-879/P FSK BURST-COMMUNICATION MODERN-SET 1 Interim Report, Oct. 1980 - Apr. 1981
Clark C. Watterson Aug. 1981 94 p refs
(Contract MIPR-80-ATC-0045)
(PB82-118944; NTIA/CR-81-13) Avail: NTIS HC A05/MF A01 CSCL 17B

A set of HF ionospheric channel simulator experiments was performed on the KY-879/P, binary-FSK, burst communication modem. The probability of a missed message, the probability of a character error, and the probability of a block error were measured as modem parameter to determine the modern performance with respect to various additive, multiplicative, and nonlinear signal distortions imposed by HF channels and the modem itself. Digital radio systems, a description of the KY-879/P modem, a description of the channel simulator, a characterization of HF channels, and a description of the experimental techniques used in the measurements are presented. GRA

N82-21505# Institute for Telecommunication Sciences, Boulder, Colo.
BROADCASTING-SATELLITE AND FIXED-SATELLITE SERVICE CONSIDERATIONS AFTER THE 1979 WORLD ADMINISTRATIVE RADIO CONFERENCE
H. Akima Apr. 1981 48 p refs
(PB82-117847; NTIS/REPORT-81-70) Avail: NTIS HC A03/MF A01 CSCL 17B

The revisions of World Administrative Radio Conference (WARC) of the inter-national radio regulations of the International Telecommunication Union (ITU) including the international table of frequency allocations are reviewed. The revised Radio Regulations will govern internationally the use of the radiofrequency spectrum and the geostationary satellite orbit for the rest of this century. Restricting its scope to the topics related to the broadcasting satellite and fixed satellite services in ITU Region 2 are reported. GRA

N82-21506# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany). Space Flight Projects.
INVESTIGATION OF THE INTEGRATION OF A TERRESTRIAL COMMUNICATIONS NETWORK WITHIN A COMMUNICATIONS SATELLITE SYSTEM
Hans Loehle Jul. 1980 29 p refs Transl. into ENGLISH of "Untersuchung zur Integration terrestrischer Kommunitaktionsnetze in Nachrichtensatellitensystemen" West Germany
(PB82-116310; BMFT-FB-W-80-002; RR-W-60-002) Avail: NTIS HC A03/MF A01 CSCL 17B

The two FORTRAN IV computer programs SIKOME and SIKOMS are combined by their input/output and form in that way a computer program system. The programs simulate a communication system as to technic and costs. Alternatives are compared: a terrestrial network under consideration of the already installed telephone and TV-network; a communication satellite system with a geostationary satellite together with the needed number of ground stations. The user is able to decide between the services (telephone and TV-transmission) separately or combined. In case of telephone, a traffic model simulates the traffic between terminal exchanges. In case of TV, the transmission starts from a single TV center and runs via satellite to the different TV participants. GRA

N82-21507# General Electric Co., Huntsville, Ala. Space Systems Div.
GRIDNET SIMULATION. VOLUME 1: SYSTEM DESCRIPTION AND RESULTS Final Report
N. Geer, H. A. Graf, and P. Stromecky Aug. 1981 64 p
(Contract NB80-SBCA-0477)
(PB82-116013; NBS-GCR-81-336; Rept-81HV008) Avail: NTIS HC A04/MF A01 CSCL 17B

A summary of the results of a computer simulation of a novel, highly connected data communication network is given. The objectives of the program were to test algorithms which would permit messages to be routed from any source to any destination, in a network having thousands of nodes, and to accomplish this routing in an efficient manner using only limited

local knowledge of network operability status. In addition, estimates were developed of the network's delay and throughput characteristics as a function of traffic loading. Based on the simulation results, GRIDNET could be developed into a highly reliable and highly survivable data communications network that could support traffic between a large number of nodes in an effective and efficient manner. GRA

N82-21508# Bologna Univ. (Italy).
RECENT RESEARCH DEVELOPMENTS IN FREQUENCY SHIFT KEYING SYSTEMS
Giorgio Corazza Mar. 1980 15 p refs Transl. into ENGLISH of Mono. "Recenti Sviluppi Delle Ricerche Sui Sistemi FSK" Rept. PB82-123449 Bologna Univ. (Italy), Mar. 1980 p 1-18 Sponsored in part by Fondazione Ugo Bordoni
(PB82-123449) Avail: NTIS HC A02/MF A01 CSCL 17B

A continuous phase frequency shift keying system was studied. It is characterized by the use of a discriminator for demodulation with rectangular modulation pulses of less than a given time duration. A reduction in transmitting power was the main objective, because it limits the application of FSK. It is shown that by proper choice of the pulse duration a power reduction of up to 6 db is obtained. It is concluded that the improvement is greater for narrow bandwidths, and that this system is suitable for multilevel transmission. GRA

N82-21509# National Telecommunications and Information Administration, Annapolis, Md.
SPECTRUM RESOURCE ASSESSMENT IN THE 4400-4990 MHz BAND
Harold J. Ng Sep. 1981 61 p refs
(PB82-122086; NTIA/REPORT-81-82) Avail: NTIS HC A04/MF A01 CSCL 17B

A spectrum resource assessment of the 4400-4990 MHz band is presented, with particular emphasis on the 4500-4800 MHz portion of the band. The effects of the implementation of the fixed satellite service on the terrestrial services in the United States are studied. Key elements such as usage trend, assignment status, future systems, system functions, and technical characteristics are identified and described for the terrestrial services. Propagation models used in the prediction of interfering emissions include line of sight, scatter field and ducting. The interaction between both tropospheric scatter, and aeronautical equipments and the receiving earth station are emphasized. GRA

N82-21510# National Telecommunications and Information Administration, Annapolis, Md.
SPECTRUM RESOURCE ASSESSMENT IN THE 1660-1710 MHz BAND
Francis P. Flynn Sep. 1981 74 p refs
(PB82-122078; NTIA/REPT-81-80) Avail: NTIS HC A04/MF A01 CSCL 17B

A quantitative assessment of spectrum management problems is provided and available options to spectrum managers dealing with these problems are identified. Included is information on allocation, frequency assignments, system characteristics and an analysis of system usage. Present spectrum management techniques and associated problems are identified by considering the interaction of the various systems for the allocated services. All problems are deemed manageable and a recommendation is made concerning sharing between the Fixed and Meteorological-Satellite Services. T.M.

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N82-21511*# National Aeronautics and Space Administration, Washington, D. C.
FUNCTIONAL ORGANIC MATERIALS FOR ELECTRONICS INDUSTRIES
Kyoichi Shibayama and Hiroshi Ono Jan. 1982 40 p refs Transl. into ENGLISH from Yuki Gosei Kagaku Kyokaishi (Japan), v. 39, no. 6, 1981 p 561-574 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-76668; NAS 1.15:76668) Avail: NTIS HC A03/MF A01 CSCL 09C

Topics closely related with organic, high molecular weight material synthesis are discussed. These are related to applications such as display, recording, sensors, semiconductors, and I.C. correlation. New materials are also discussed. General priniciples of individual application are not included. Materials discussed include color, electrochromic, thermal recording, organic photoconductors for electrophotography, and photochromic materials. N.W.

N82-21512# Edgerton, Germeshausen and Grier, Inc., Salem, Mass.
HIGH VOLTAGE, LOW INDUCTANCE HYDROGEN THYRATRON STUDY PROGRAM, PHASE 3 Final Report, 4 Mar. - 3 Sep. 1980
Robert F. Caristi and Steven Friedman Fort Monmouth, N.J. Army Electronics Research and Development Command Dec. 1981 22 p
(Contract DAAK20-79-C-0283; DA Proj. 1L1-62705-AH-94-02)
(AD-A110132; DELET-TR-79-0283-F) Avail: NTIS HC A02/MF A01 CSCL 09/1

The experimental tube required under the terms of this contract has been designed, built and characterized for voltage holdoff under pulsed charge conditions. This tube (Type HY-5527) exhibited a total holdoff characteristic that was somewhat inferior to that of its predecessor - Type HY-5525. The difference is believed to be attributable to the first-stage holdoff of the HY-5527 which was low compared with that of the HY-5525. Arc damage during conditioning is proposed to account for the HY-5527's poorer first-stage holdoff. Data are also shown for the Type HY-5553, a three-stage device designed and built under a subsequent phase of the overall program. This tube exhibited a total holdoff characteristic that exceeded those of both the HY-5525 and the HY-5527 in the high pressure regime - the region of interest. Future plans call for further testing of the HY-5553 and another tube of a differing design that appears promising. On the basis of these tests another generation of tubes will be designed, built and characterized at high pulse repetition rates and high rates of anode current rise. Author (GRA)

N82-21513# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SLIDE SWITCH
V. V. Yefremov and D. A. Chikunov 30 Dec. 1981 5 p Transl. into ENGLISH of Russian Patent no. 205896 (2 Dec. 1967) p 56-57
(AD-A110285; FTD-ID(RS)T-1327-81) Avail: NTIS HC A02/MF A01 CSCL 09/1

A Russian patent for a slide switch is described. Improved reliability of its operation is achieved by the fact that the guiding strip is provided with a hole which holds an additional ball, which is pressed against the upper contact bar by a ball detent in the operating position of the sliding contact. L.F.M.

N82-21514# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
FOUR PORT CIRCULATOR
V. V. Oress, I. A. Naumov, and A. K. Stolyarov 30 Dec. 1981 5 p Transl. into ENGLISH of Russian Patent no. 224629 (12 Aug. 1968) p 57-58
(AD-A110284; FTD-ID(RS)T-1274-81) Avail: NTIS HC A02/MF A01 CSCL 09/1

The circulator is a waveguide slotted bridge, at the center of which, along the axis of symmetry, is a set of toroidal ferrites arranged on a dielectric sleeve. As a result of this design, the overall dimensions of the circulator are reduced and the tuning of the circulator is simplified. An experimental model of a four port circulator was constructed in the 3-cm range of waves.

with the direct losses of not over 1 dB and decouplings of not less than 19 dB in all the channels. T.M.

N82-21515# Naval Surface Weapons Center, White Oak, Md.
SLOW WAVE GYROTRON AMPLIFIER WITH A DIELECTRIC CENTER ROD Final Report
Joon Y. Choe and Hans S. Uhm Sep. 1981 39 p refs (AR01109)
(AD-A110027; NSWC/TR-81-387) Avail: NTIS HC A03/MF A01 CSCL 09/1

The broad band capability of the gyrotron amplifier with a dielectric center rod is investigated. The dispersion relation for the TE mode perturbation is obtained, and the system parameters for the optimum bandwidth are obtained for a small axial velocity spread. It is found that the dielectric center rod extends the frequency range of the intermediate wavelength mode (IWM), and reduces the contribution of the troublesome short wavelength mode (SWM). The bandwidth and the gain due to the IWM for the center rod geometry are superior to those for the wall clad dielectric gyrotron. Author (GRA)

N82-21516# Varian Associates, Palo Alto, Calif. Microwave Tube Div.
HIGH EFFICIENCY AMPLIFIER Final Technical Report, Oct. 1979 - Sep. 1981
W. R. Ayers, R. H. Glebeler, L. R. Veselovsky, and F. Ruth Walker Griffiss AFB, N.Y. RADC Oct. 1981 56 p
(Contract F30602-80-C-0052; AF Proj. 4506)
(AD-A110340; RADC-TR-81-288) Avail: NTIS HC A04/MF A01 CSCL 09/1

An exploratory development model was designed, constructed and evaluated. The design followed the criterion set forth in efficiency improvements in Coupled Cavity TWTs with the exception of a confined flow beam instead of brilluoin focusing. The results exceeded all performance parameters except interaction efficiency. Electronic efficiency, however was found to be 45% with 33% depression of a standard single stage collector. The measured interaction efficiency agreed well with predicted efficiency. Bandwidth of 500 MHz with 5db maximum variation was displayed and very low ripple in both amplitude and phase. Tube stability was excellent. GRA

N82-21517# Hughes Aircraft Co., Torrance, Calif. Electronic Dynamic Div.
THE 3.2 MILLIMETER WAVE TRANSMITTER TUBE Interim Report, 1 Jun. - 30 Sep. 1981
Jon A. Davis Fort Monmouth, N. J. Army Electronics Research and Development Command Dec. 1981 14 p
(Contract DAAB07-78-C-3015; DA Proj. 1L1-62705-AH-94)
(AD-A110160; EDD-W-08133; DELET-TR-78-3015-4) Avail: NTIS HC A02/MF A01 CSCL 09/1

During this period the beam tester was successfully re-tested with the original design magnets, which were saturated to 5100 Gauss. Because of the stronger field and, presumably, less radial field on axis because of the more uniform nature of saturated magnets, the beam transmission was dramatically improved from 77% to 96%. The successful operation of the beam tester has demonstrated that the PPM focusing scheme will provide excellent beam focusing of the 982H TWT. Author (GRA)

N82-21518# Texas Technological Univ., Lubbock. Plasma and Switching Lab.
COORDINATED RESEARCH PROGRAM IN PULSED POWER PHYSICS Annual Report, 1 Oct. 1980 - 30 Sep. 1981
M. Kristiansen and M. C. Hagler 1 Dec. 1981 255 p refs
(Contract F49620-79-C-0191; AF Proj. 2301)
(AD-A110409; AFOSR-82-0018TR; AR-2) Avail: NTIS HC A12/MF A01 CSCL 20/3

Ten program elements related to pulsed power research are described. These program elements form a multi-disciplinary, coordinated program whose main emphasis is to gain improved understanding of high power, repetitive closing and opening switches. The main emphasis is concerned with triggering of discharges in gas filled spark gaps and the associated electrode erosion and insulator damage. Considerable efforts are also being made to understand the limitations and fundamental discharge phenomena in fast opening switches for inductive energy storage. A novel electromechanical pulse generator which promises to deliver fast, repetitive pulses to a load is also being investigated. GRA

N82-21519# Engins Matra, Velizy (France).
THE CHOICE BETWEEN MOS TECHNOLOGY AND BIPOLAR TECHNOLOGY FOR ANALOG APPLICATIONS [TECHNOLOGIE MOS OU TECHNOLOGIE BIPOLAIRE POUR APPLICATION ANALOGIQUES]
E. Rabeyrin 26 Mar. 1980 12 p In FRENCH
(Note-DX70/0.108) Avail: NTIS HC A02/MF A01

Specific characteristics inherent to the two technologies were compared for analog applications. As bipolar technology is already well established for use in analog circuitry, it was taken as a reference by which MOS technology was assessed. Input noise, temperature effects and aging effects on MOS were studied. Interfacing MOS with external circuits was also considered. The particular case of analog power circuits was reviewed. Results show that many analog functions can be handled with MOS. However, the best performance is still obtained with bipolar technology, especially as concerns power circuits. One exception is that MOS allows for a higher integration density in frequency filters. In conclusion, the only LSI technology which permits the combination of analog and digital on the same chip remains bipolar ion implanted logic. Author (ESA)

N82-21520# National Physical Lab., Teddington (England). Dept. of Electrical Science.
ON OBTAINING THE HENRY FROM THE FARAD
G. H. Rayner, B. P. Kibble, and M. J. Swan Mar. 1980 13 p
(NPL-DES-63; ISSN-0143-7305) Avail: NTIS HC A02/MF A01

A self-inductor is made to resonate in a parallel tuned circuit with an adjustable capacitor at a measured frequency so that the impedance of the combination is purely resistive. This method replaces the older Campbell one; it is more accurate, more reliable and more up-to-date. The conductance and residual capacitance of the tuned circuit are measured on a capacitance bridge. The capacitance of the adjustable capacitor and its shunt conductance are then measured separately on the bridge. These measurements together with some corrections of a few ppm for the lead inductance and bridge error are sufficient to determine the value of the self-inductance with a standard error of 3 ppm for inductor of high Q in the 0.05 to 1 Henry range at continuity is however assured to 10 ppm. Author (ESA)

N82-21521# National Physical Lab., Teddington (England). Div. of Electrical Science.
A TEMPERATURE OFF-LIMIT ALARM
R. B. D. Knight May 1980 9 p
(NPL-DES-65; ISSN-0143-7305) Avail: NTIS HC A02/MF A01

The design of a battery operated temperature alarm which senses any departure beyond preset high or low temperature limits and sounds an audible warning is discussed. Current drain is very small, so a battery life of at least two years is predicted. Low battery voltage triggers a special warning signal. The device is built around a national semiconductor LM1801, and contains a high input impedance operational amplifier, a regulator for controlling the voltage supplied to a thermistor bridge, a low battery voltage detector and warning circuit, provision for signalling to other alarms and a current consumption guaranteed to be 9 microamps or less. Author (ESA)

N82-21522# Forschungsinstitut fuer Hochfrequenzphysik, Werthhoven (West Germany).
COMPUTERIZED DESIGN OF STRIP LINE STRUCTURES [BERCHNUNG VON STREIFENLEITERSTRUKTUREN]
G. Hueschelrath Dec. 1979 41 p refs In GERMAN; ENGLISH summary
(FFM-292) Avail: NTIS HC A03/MF A01

Computer programs for the computer aided design of strip line structures are evaluated. Three different programs are described, and calculations for the most common strip lines are presented. The first program is based on a variational method for the analysis of microstrip lines. Transmission line properties of parallel strips separated by a dielectric sheet are elucidated in reference to standard strip line circuit designs. The second

program involves parameterization of strip lines in consideration of packaging. A strip line with rectangular outer conductor and three dielectric layers is treated in detail. The third program uses a finite element method to calculate generalized strip line structures. Application in design of suspended substrate integrated circuits is shown. Author (ESA)

N82-21523# Forschungsinstitut fuer Hochfrequenzphysik, Werthhoven (West Germany).

DEVELOPMENT OF 'PARTNER FILTERS' IN THE VHF RANGE [ENTWICKLUNG EINES PARTNER-FILTERS IM ZF-BEREICH]

G. Wiskocil Mar. 1980 29 p In GERMAN; ENGLISH summary Original contains color illustrations

(FFM-293) Avail: NTIS HC A03/MF A01

The 'partner filter' concept is introduced, and the development of a demonstration partner filter for a five channel receiver is recounted. Starting with a group antenna source, known suboptimal transmission interference signals are suppressed from the intended sidelobe pattern. The scheme involves ordering each receiving element, through a master element, with a partner element. The partner filter uses adaptive weighting and summation to arrive at an estimated value for the interference signal, which is then sent to the master element where it is eliminated. Analog circuitry was built and tested, proving the design function. The circuit board model, including four analog circuits, two multipliers, two correlators, and two integrators, is presented. Further applications, utilizing thick film hybrid circuit technology, are suggested. Author (ESA)

N82-21524# General Electric Co. Ltd., Wembley (England) Electronic Devices Research Labs.

DEVELOPMENT OF A CCD IMAGE SENSOR, PHASE 3 Final Report

D. J. Burt and S. L. Partridge Paris ESA May 1980 50 p refs

(Contract ESTEC-3286/77/NL-AK(SC))

(Rept-165706; ESA-CR(P)-1401) Avail: NTIS HC A03/MF A01

An array was developed containing 385 x 288 photosensitive elements (385 x 576 elements with standard TV interlace) which is capable of satisfying the requirements applicable primarily to star sensors. An array was designed, fabricated and operated to give a 625 line compatible display. The device is a three level version requiring a three phase drive waveform. With the exception of the channel stop, no single mask dimension smaller than 8 microns is used. Drive circuitry uses a Ferranti ZNA 134 synchronizing pulse generator chip and other transistor-transistor logic packages. Transfer efficiency and dark current results are given with values from on-chip output circuitry, for arrays from several batches. Author (ESA)

N82-21525# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Electronique et Physique.

VERY FAST, HIGHLY RELIABLE, SUBOPTIMAL KALMAN FILTER WITH INTERNAL RECONFIGURATION Ph.D. Thesis [FILTRE DE KALMAN SOUS OPTIMAL DE TRES HAUTE FIABILITE ET VITESSE A RECONFIGURATION INTERNE]

Vinod Kumar Jun. 1980 288 p refs In FRENCH Sponsored by the French Government

(ENST-E-80014) Avail: NTIS HC A13/MF A01

The equations of the suboptimal, recursive Kalman-Bucy filter algorithm were analyzed for a process with linear, stationary equations of evolution and observation. A breadboard model of the recursive filter system was built, using analog circuits in order to reduce the period between observations (from 0.5 msec to 15 microsec), although incurring a slight reduction in calculation precision (2 %). Active triplex redundancy was also built in. Analog circuit diagrams for each of the filters, and for three possible architectures (series, parallel, series-parallel), are given. Diagrams of the detection and breakdown localization circuitry that commands the reconfiguration are shown. Failure mode effect analysis allows for calculation of predicted reliability. Experimentally measured performance of the analog calculation circuits is assessed. Author (ESA)

N82-21526# Engins Matra, Velizy (France).

MODELING NOISE AND THE MODULATION TRANSFER FUNCTIONS IN THE FAIRCHILD CCD 133/143 [MODELISATION DES BRUITS ET DES FONCTIONS DE TRANSFERT DE MODULATION DANS LE CCD FAICHILD 133/143]

B. Roy 30 Mar. 1981 16 p In FRENCH

(SOBT/NT/005) Avail: NTIS HC A02/MF A01

The difference between surface channel and buried or bulk channel charge coupled devices is explained. For the physical study of the bulk 133/143, CCD both temporal noise which corresponds to fluctuations of a detector element in function of time for an invariable input; and spatial fluctuations which follow the curve of mean temporal fluctuations for each photoelement were distinguished. Noise models are presented for shot noise, dark signal noise, and noise sources in the registers, i.e. bulk trapping noise and output stage noise. The modulation transfer function (MTF) measures the response of a point on the CCD array to a spatially modulated luminous input. The geometric MTF, the transfer MTF, and the diffusion MTF are considered and modeled. Author (ESA)

N82-21527# Fernmeldetechnisches Zentralamt, Darmstadt (West Germany). Forschungsinst.

A MILLIMETER WAVE 528 M BITS/SEC FOUR PHASE DIGITAL PHASE SHIFT KEYING REGENERATIVE REPEATER

Hans-Joachim Heun, Eberhard Kuehn, Heribert Raubal, Peter Geisel, and Gerhard Joest Aug. 1980 109 p refs In GERMAN; ENGLISH summary

(Rept-442-TBr-64) Avail: NTIS HC A06/MF A01

The design, construction and performance of a regenerative repeater intended for transmission of two isochronous baseband data streams via a digital phase shift keying (DPSK) modulated millimeter wave carrier at a rate of 264 Mbits/sec is described. The properties of the phase locked oscillator, the cascaded modulator, the encoder, and the switching unit of the transmitter module were established. The demands on the receiver as regards noise interference, differential demodulation, internal reflection suppression, and decoding were reviewed. After alignement of the individual components, the regenerative repeater was set up and optimized with the aid of a bit error rate test assembly. Results show that a signal-to-interference ratio of 21 dB is required to obtain a bit error rate of 10 to the -9. The repeater gain then equals 77.5 dB. Author (ESA)

N82-21528# Nice Univ. (France). Lab. d'Electronique.

ANALYSIS AND SYNTHESIS OF MICROSTRIP LINE MICROWAVE FILTERS European Concerted Action. Composants et Circuits Miniaturises Final Report [ANALYSE ET SYNTHESE DES FILTRES MICROONDES A LIGNES MICROURUBAN]

Edouard Rivier, Dominique Pompei, Alain Ros, and Olivier Benvello 1980 39 p ref In FRENCH Prepared in cooperation with Limoges Univ., France

(Contract DGRST-75-5-0697)

Avail: NTIS HC A03/MF A01

A set of data sheets (graphs), concerning coupled microstrip lines deposited on various dielectric substrates, are presented. These graphs portray in orders of magnitude the evolution of significant parameters. Impedance and mode velocity in function of diverse geometries, and for common substrates, are shown. The variability of velocity in function of increasing frequency is also depicted. Author (ESA)

N82-21529# National Physical Lab., Teddington (England). Div. of Electrical Science.

TWO PROTOTYPE DOUBLE DUAL-SLOPE DIGITAL WATTMETERS

R. B. D. Knight and J. R. Stockton Jan. 1981 27 p refs

(NPL-DES-60; ISSN-0143-7305) Avail: NTIS HC A03/MF A01

Implementation of the double dual-slope digital sampling wattmeter principle is outlined. This development permits the attainment of high performance by an instrument of moderate cost. The first instrument measures ac power, from analog inputs representing the voltage and current waveforms, at a rate approaching one reading per second. The resolution is 0.01% of nominal full scale, with some over-ranging, and the linearity is better than 0.02%. The second instrument also incorporates input transducers and automatic frequency ranging and has a similar

performance. The basic principles of the instruments, and the results obtained, are indicated, and photographs of both instruments, dismantled and assembled, together with a block diagram of the system, are attached. Author (ESA)

N82-21530# Royal Signals and Radar Establishment, Malvern (England).
AUTOMATIC MEASUREMENT OF CATHODE RAY TUBE MODULAR TRANSFER FUNCTIONS
G. Anstey and M. J. Dore Aug. 1980 19 p refs
(RSRE-MEMO-3301; BR76188) Avail: NTIS HC A02/MF A01

A semiautomatic facility which directly plots the dynamic modulation transfer function is described. A sine wave pattern is generated which moves at a chosen rate across the screen using a variable frequency oscillator (VFO). The intensity of the spatial pattern is measured by a stationary optical detector consisting of a Ferranti Microspot analyzer, photomultiplier peak detector and hold circuits. To provide automatic operation, the ramp output from the chart recorder (which is proportional to the X deflection) is fed via an interface circuit into the voltage controlled oscillator input of the VFO. The spatial frequency displayed by the CRT is therefore linearly related to the X deflection of the chart recorder. The potential of pulse output signal processing for determining the ultimate performance capability of CRT'S is discussed. Circuit diagrams are given and circuit operations are described. Author (ESA)

N82-21531# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
A GENERAL PURPOSE CORRELATOR
G. R. Ochs, W. D. Cartwright, B. W. Guderian, and S. Y. Simpson Jul. 1981 23 p refs Prepared in cooperation with RADC, Griffiss AFB.
(Contract P30602-80-F-0248)
(PB82-124546; NOAA-TM-ERL-WPL-74; NOAA-8192903) Avail: NTIS HC A02/MF A01 CSCL 09E

A correlator for general laboratory use is described that calculates the time-delayed correlation of two electrical signals in real time. The instrument described is an improved version of a type used for some time. It computes both the correlation and covariance of input signals as a function of time delay and provides an output for displaying the function on an oscillocope or a chart recorder. GRA

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N82-21532*# Douglas Aircraft Co., Inc., Long Beach, Calif.
LAMINAR FLOW CONTROL SPF/08 FEASIBILITY DEMONSTRATION Final Report
R. C. Ecklund and N. R. Williams Oct. 1981 50 p
(Contract NAS1-16425)
(NASA-CR-165818; NAS 1.26:165818) Avail: NTIS HC A03/MF A01 CSCL 20D

The feasibility of applying superplastic forming/diffusion bonding (SPF/DB) technology to laminar flow control (LFC) system concepts was demonstrated. Procedures were developed to produce smooth, flat titanium panels, using thin -0.016 inch sheets, meeting LFC surface smoothness requirements. Two large panels 28 x 28 inches were fabricated as final demonstration articles. The first was flat on the top and bottom sides demonstrating the capability of the tooling and the forming and diffusion bonding procedures to produce flat, defect free surfaces. The second panel was configurated for LFC porous panel treatment by forming channels with dimpled projections on the top side. The projections were machined away leaving holes extending into the panel. A perforated titanium sheet was adhesively bonded over this surface to complete the LFC demonstration panel. The final surface was considered flat enough to meet LFC requirements for a jet transport aircraft in cruising flight. Author

N82-21533# Aeronautical Research Labs., Melbourne (Australia).
TURBULENT BOUNDARY LAYERS IN STRONG ADVERSE PRESSURE GRADIENTS
W. H. Schofield Jul. 1980 90 p refs
(ARL/Mech-Eng-Rept-157; AR-002-218) Avail: NTIS HC A05/MF A01

A analysis of equilibrium boundary layers based on the Schofield and Perry defect law for flow in moderate to strong adverse pressure gradient is presented. The conditions derived for self-preserving or precise equilibrium boundary layers differ from those given by previous analyses based on the usual velocity defect law. It is shown that nine observed boundary layers on smooth walls conform to these new conditions for equilibrium flow. As the analytical expression for the Schofield and Perry defect law does not vary with pressure gradient, and explicit expression for the shear stress profile in any equilirium layer can be derived. Predicted shear stress profiles show good agreement with experimental data. Limits for the flow parameters within which equilibrium boundary layers can exist are derived and it is shown that observed boundary layers fall witnin these limits. Results by previous workers are shown to be consistent with these limits. Author

N82-21534# Massachusetts Inst. of Tech., Cambridge. Gas Turbine and Plasma Dynamics Lab.
CURRENT PROBLEMS IN TURBOMACHINERY FLUID DYNAMICS Final Report, 1 Oct. 1979 - 30 Sep. 1981
Edward M. Greitzer, William T. Thompkins, Jr., James E. McCune, Alan H. Epstein, and Choon S. Tan 30 Nov. 1981 136 p refs
(Contract F49620-78-C-0084)
(AD-A110432; AFOSR-82-0027TR) Avail: NTIS HC A07/MF A01 CSCL 20/4

A multi-investigator effort on problems of current interest in turbomachinery fluid dynamics is being carried out in the Gas Turbine & Plasma Dynamics Lab. of MIT. Within the overall program, four different tasks having to do with a wide range of design and off-design flow fields have been identified. These are: (1) investigation of fan and compressor design point fluid dynamics (including formulation of design procedures using current three-dimensional transonic codes and development of techniques for instantaneous temperature measurements in transonic fans); (2) studies of compressor stability enhancement (including basic investigations of fluid dynamics of compressor casing/hub treatment); (3) fluid mechanics of gas turbine engine operation in inlet flow distortion (including inlet vortex distortion and combined circumferential/radial distortions); and (4) investigations of three-dimensional flows in highly loaded turbomachines (including actuator duct theory and blade-to-blade flow analysis) and linearized analysis of swirling three-dimensional flows in turbomachines. This report summarizes the work carried out to data as well as indicates the direction of future efforts on these tasks. GRA

N82-21535# Brennen (C. E.), Sierra Madre, Calif.
A REVIEW OF ADDED MASS AND FLUID INERTIAL FORCES Final Report, Apr. - Nov. 1981
C. E. Brennen Port Hueneme, Calif. NCEL Jan. 1982 54 p refs
(Contract N62583-81-MR-554; ZR00001184)
(AD-A110190; CEL-CR-82.010) Avail: NTIS HC A04/MF A01 CSCL 20/4

This report reviews the existing state of knowledge concerning the evaluation of the forces imposed on a body in a fluid due to acceleration of either the body or the fluid. It concentrates on those fluid inertial forces due to acceleration rather than on the drag/lift forces due to steady motion. The first part of the report presents a survey of the analytical background including the definition of added mass, the structure of the added mass matrix and other effects such as the influence of viscosity, fluid compressibility and the proximity of solid and free surface boundaries. Then the existing data base from experiments and potential flow calculations is reviewed. Approximate empirical methods for bodies of complex geometry are explored in a preliminary way. The possible dramatic effects of the proximity

of the ocean bottom are further highlighted. The confused state of affairs regarding the possibly major effects of viscosity in certain regimes of frequency and Reynolds number is discussed. Finally a number of recommendations stemming from ocean engineering problems are put forward. Author (GRA)

N82-21536# Defence Research Establishment Suffield, Ralston (Alberta).
SIGNAL PROCESSING OF SHOCK-WAVE OVERPRESSURE RECORDS
James J. Gottlieb, David V. Ritzel, and Irene A. Miskew Aug. 1981 44 p refs
(AD-A109896; DRES-MEMO-1021) Avail: NTIS HC A03/MF A01 CSCL 09/2

Successful methods for numerically processing overpressure-time measurements of shock and blast waves and sonic booms are presented and illustrated with sample results. These methods include: the elimination of high-frequency random and other noise from the measurement by employing a fast-Fourier-transform technique and judiciously altering the high-frequency part of the Fourier spectrum; the removal of low-frequency periodic fluctuations including baseline shift and drift from the record by using specially developed techniques described in the report; and the extraction of information from the processed shock-wave record including shock wave arrival time, positive-phase duration and impulse, peak overpressure, rise time, and overpressure decay rate. Author (GRA)

N82-21537# Princeton Univ., N. J. Dept. of Mechanical and Aerospace Engineering.
SHOCK WAVE/TURBULENT BOUNDARY LAYER INTERACTIONS IN TWO AND THREE DIMENSIONS Final Report, 1 Aug. 1980 - 31 Jul. 1981
Gary S. Settles 15 Dec. 1981 30 p refs
(Contract F49620-80-C-0092; AF Proj. 2307)
(AD-A110423; MAE-1546; AFOSR-82-0001TR) Avail: NTIS HC A03/MF A01 CSCL 20/4

Basic experimental research was conducted in two and three dimensional shock wave/boundary layer) interactions and associated turbulence measurements. The primary emphasis has been in exploring the important but little-known range of three dimensional interactions at high speeds. Building on previous work, a series of parametric experiments and a detailed analysis have led to the synthesis of scaling laws for Reynolds number effects on these interactions. Further experiments continued the adaptation and use of hot-wire anemometry in high-Reynolds number supersonic flows. Hot-wire surveys were made in the previously-explored flowfield of a reattaching free shear layer, and in the interaction generated by a two dimensional compression corner of 8 deg deflection angle at Mach 3. Other research activities, including technique, instrumentation, and facility development are summarized in this report. GRA

N82-21538# Naval Underwater Systems Center, New London, Conn.
A NUMERICAL TREATMENT OF THE DYNAMIC MOTION OF A ZERO BENDING RIGIDITY CYLINDER IN A VISCOUS STREAM
Ding Lee and Robert M. Kennedy 15 Jan. 1982 44 p refs
(AD-A110089; NUSC-TR-6343A) Avail: NTIS HC A03/MF A01 CSCL 20/4

Previous attempts to derive the homogeneous closed form solution to the problem of the dynamic motion of a zero bending rigidity cylinder in a viscous stream have expressed the solution as an infinite series involving Bessel functions of complex argument and order, which are often impractical to evaluate because of their complexity. Moreover, when these solutions are extended to nonhomogeneous situations, a harmonic time dependence is assumed that requires forcing the system by an arbitrary time function using multiple solutions combined in the Fourier sense. This paper presents a general purpose numerical treatment formulated to overcome these difficulties. The numerical approach is based on finite difference schemes applied in conjunction with powerful numerical ordinary differential equation methods. The theory is examined with respect to consistency, stability, and convergence of these numerical procedures. A numerical example is included to demonstrate the validity of the treatment. Although an explicit boundary condition is absent from this study, a derived boundary condition is demonstrated to be adequate. Author (GRA)

N82-21539# Science Applications, Inc., McLean, Va.
FLUID DYNAMICS-REACTIVE FLOW MODELING Final Report
Ellis Hyman, Mark Fry, Jeff Tittsworth, David Fyfe, and K. Kailasanath 16 Dec. 1981 92 p refs
(Contract N00014-81-C-2085)
(AD-A109947; SAI-82-655-WA) Avail: NTIS HC A05/MF A01 CSCL 20/4

This work includes (1) adaptations of the FAST2D code for slow flow applications, (2) use of the FAST2D code to model vorticity and turbulence flow efficiently, (3) an analytical and computational study of the ignition and quenching of laminar flames in a premixed H2, O2, N2 mixture, and (4) incorporation of the latest reactive flow computer packages into the NRL ionosphere code. GRA

N82-21540# Minnesota Univ., Minneapolis. Dept. of Mechanical Engineering.
STUDIES OF HEAT TRANSFER IN COMPLEX INTERNAL FLOWS Summary Report, 15 Dec. 1980 - 15 Dec. 1981
E. M. Sparrow and S. V. Patankar Jan. 1982 112 p refs
(Contract N00014-79-C-0621; NR Proj. 097-437)
(AD-A110396; SR-2) Avail: NTIS HC A06/MF A01 CSCL 20/13

The details of five separate but interrelated research problems are described in this report. The general theme which runs through the work is a search for the effects of flow maldistribution on heat transfer in various types of heat exchange devices. The research includes both experiment and analysis and deals with turbulent flows. The first of the experiments is concerned with the heat transfer and pressure drop response of a tube tank to maldistribution of the flow at the inlet cross section. The second experiment, local turbulent heat transfer coefficients for airflow were measured in a tube situated downstream of a cylindrical plenum chamber in which the inflow was radial and the outflow was axial. The third experiment also deals with maldistribution, in particular, that created when there is a missing tube in a staggered or in-line tube bank. GRA

N82-21541# Wright State Univ., Dayton, Ohio.
PROBLEMS IN FORCED UNSTEADY FLUID MECHANICS Final Technical Report, 1 Nov. 1977 - 31 Oct. 1980
Hermann Viets, Michael Platt, Mont Ball, Richard J. Bethke, and David Bougine Wright-Patterson AFB, Ohio AFWAL Nov. 1981 245 p refs
(Grant AF-AFOSR-3525-78; AF Proj. 2307)
(AD-A110291; AFWAL-TM-81-148-FIMM) Avail: NTIS HC A11/MF A01 CSCL 20/4

Forced unsteady fluid flows are examined from the point of view of positive implications of the time dependency. Particular problems examined in a forced unsteady mode are jets, wind tunnels, wings, ramps and diffusers, dump combustors and vortex structure. Two methods of forcing the flow are studied in detail: fluidic feedback and a cam-shaped rotor. The fluidic method produces an unsteady jet while the rotor acts as a time dependent vortex generator. Potential performance improvements with unsteady flow are evident in all of the flows examined. Author (GRA)

N82-21542# Sandia Labs., Livermore, Calif. Thermal Sciences Div.
RADSOLVER: A COMPUTER PROGRAM FOR CALCULATING SPECTRALLY-DEPENDENT RADIATIVE HEAT TRANSFER IN SOLAR CAVITY RECEIVERS
M. Abrams Sep. 1981 58 p refs
(Contract DE-AC04-76DP-00789)
(DE82-000833; SAND-81-8248) Avail: NTIS HC A04/MF A01

RADSOLVER is a computer program which calculates the radiation energy transport in cavity type receivers having an arbitrary number of apertures through which collimated beams of solar radiation enter. In contrast to the common assumption of gray (or semi-gray) surfaces used in the modeling of radiation transport, RADSOLVER accounts for the wavelength-depndence of emission, absorption and reflection with a band model of the

radiative properties. Illustrative examples along with input and output are presented. DOE

N82-21543# Commission of the European Communities, Karlsruhe (West Germany). European inst. for Transuranium Elements.

PRESENT STATUS OF RAREFIED GAS DYNAMICS APPROACH TO THE STRUCTURE OF A LASER INDUCED EVAPORATING JET

C. Cercignani (Istituto di Matematica del Politecnico di Milano) 1980 95 p refs

(EUR-6843) Avail: NTIS (US Sales Only)HC A05/MF A01; DOE Depository Libraries

With reference to the relation between the state of the surface and the measurements downstream in the dynamic laser pulse technique, the problems arising in connection with the study of the structure of a jet evaporating into a vacuum are investigated. Particular attention is paid by the gas surface interaction, internal degrees of freedom, presence of more than one species and chemical reactions. DOE

N82-21544# Biphase Engines, Inc., Santa Monica, Calif.

TWO-PHASE FLOW RESEARCH. PHASE 1: TWO-PHASE NOZZLE RESEARCH Final Report

Stephen J. Toner Jul. 1981 193 p refs

(Contract DE-AC03-80ER-10687)

(DE81-030873; DOE/ER-10687/T1) Avail: NTIS HC A09/MF A01

Experimental performance of converging-diverging nozzles operating on air-water mixtures is presented for a wide range of parameters. Thrust measurements characterized the performance and photographic documentation was used to visually observe the off-design regimes. Thirty-six nozzle configurations were tested to determine the effects of convergence angle, area ratio, and nozzle length. In addition, the pressure ratio and mass flowrate ratio were varied to experimentally map off-design performance. The test results indicate the effects of wall friction and infer temperature and velocity differences between phases and the effect on nozzle performance. The slip ratio between the phases, gas velocity to liquid velocity, is shown to be below about 4 or 5. T.M.

N82-21545# Aix-Marseilles Univ. (France).

CONTRIBUTION TO THE STUDY OF THE MECHANISMS OF TURBULENT DIFFUSION AND OF RELATED MATTERS Ph.D. Thesis

Alain Mailliat Dec. 1980 121 p refs In FRENCH

(FRNC-TH-1028) Avail: NTIS (US Sales Only) HC A06/MF A01; DOE Depository Libraries

Turbulent diffusion mechanisms and the related problems are studied. The diffusion mechanisms considered are those which concern a passive scalar contaminant not subject to molecular effects. This latter character makes it possible to isolate in the diffusion phenomenon that which is inherent in the turbulent dispersion. The system of natural coordinates for following the movement of a particle and for describing the dispersion is that of Lagrange. This description must be statistical, hence, the specific properties of the probability densities of the velocities and movements in this type of coordinate are examined. The expressions of the probability densities of the concentration and turbulent flow of a contaminant are sought. These expressions make it possible to formulate the diffusion laws linking the mean flow and concentration to the statistical characteristics of the velocity field. DOE

N82-21546# Atomic Weapons Research Establishment, Aldermaston (England).

A QUICK METHOD FOR CALCULATING TRANSIENT TEMPERATURES ARISING FROM CIRCULAR MICROCIRCUIT HEAT SOURCES

D. J. Dean London HMSO Nov. 1980 26 p refs

(AWRE-O-36/80; BR76798; ISBN-0-855181-43-5) Avail: NTIS HC A03/MF A01; HMSO £ 1.50 PHI

A series summation computation method suitable for pocket calculators is presented. The rapid degradation in reliability which occurs with temperature makes it useful to evaluate the effects of different geometries, the transient flow from a heat source mounted on the upper surface on a thin substrate with a heat sink on its rear face. At each stage in the summation, the corresponding term in the particular series is replaced by that of the general series. At the same time the ratio of these two terms multiplied by the ratio of the balance of the series to the value of the summation at that time is evaluated to give the maximum error and hence the state of convergence. Author (ESA)

N82-21547# National Engineering Lab., East Kilbride (Scotland). Fluid Mechanics Group.

THROUGH FLOW ANALYSIS OF PUMPS AND FANS

A. N. Neal Aug. 1980 33 p refs Sponsored by Mech. Eng. and Machine Tool Requirements Board of Dept. of Ind.

(NEL-669) Avail: NTIS HC A03/MF A01

Incompressible through flow calculations in axial, mixed and centrifugal flow pumps and fans are described. An iterative scheme is used. A simple blade to blade model is applied on the surfaces of revolution defined by the meridional streamlines. This defines the fluid properties and the mean stream surface (S2 surface) for the next meridional solution. A computer program is available allowing the method to be applied for design purposes. APL is used for input and output and FORTRAN IV for computation. A typical calculation requires 30 sec of Univac 1100 time. Author (ESA)

N82-21548# National Engineering Lab., East Kilbride (Scotland). Flow Measurement Div.

PROVING THE TRACEABILITY OF FLOW MEASUREMENT LABORATORIES

E. A. Spencer Sep. 1980 24 p refs Presented at Transducer 1978 Conf., London, Jun. 1978

(NEL-670) Avail: NTIS HC A02/MF A01

A 150 mm turbine flowmeter with upstream and downstream pipes was used as a transfer package to establish the intercalibration of the flow measurement weighbridge and volumetric systems at three laboratories. The uncertainty between the laboratories are within a range of 0.1 %. A technique capable of discriminating between the various sources of uncertainty is also briefly discussed. Author (ESA)

N82-21549# National Maritime Inst., Teddington (England).

A CIRCULAR CYLINDER OSCILLATING IN STILL WATER, IN WAVES AND IN CURRENTS

R. V. Matten, B. Hogben, and R. M. Ashley Jul. 1979 23 p refs Presented at IAHR Symp. on Mech. of Wave-Induced Forces on Cylinders, Bristol, England, Sep. 1978 Sponsored by Dept. of Energy's Offshore Energy Technology Board

(NMI-R-63; OT-R-7944) Avail: NTIS HC A02/MF A01

Pressure distribution around a circular cylinder in a variety of flow fields was measured in a test tank in order to obtain design information relevant to marine risers. Instantaneous pressure distributions for the cylinder oscillating in still water at a Reynolds number of 270,000 and a Keulegan-Carpenter number of 18 are presented. The integrated pressure forces compare well with data from experiments in which the forces were measured directly. An axial component of velocity is found to substantially alter the flow field, emphasizing that force coefficients obtained from two dimensional flow experiments may not be directly applicable to the three dimensional flows encountered in practice. Author (ESA)

N82-21550# Centre Technique des Industries Mecaniques, Senlis (France). Dept. de Mecanique des Fluides et Thermique.

THE CALCULATION OF PULSATIONS IN FLUIDIC CIRCUITS Final Report [LE CALCUL DES PULSATIONS DANS LES CIRCUITS FLUIDES]

J.-P. Lecerf and J. Lallement 2 Dec. 1980 125 p refs In FRENCH Presented at CETIM's Training Course on Analyse et Simulation des Systemes Hydrauliques, Senlis, France, 2-4 Dec. 1980

(CETIM-E-435-00-Pt-b) Avail: NTIS HC A06/MF A01

The analysis and simulation of hydraulic systems are reviewed. Fundamental equations for system vibrations are recalled. An harmonic analysis and decomposition into Fourier series of the forced pulsations from a pump are presented. Fluid mechanics of liquid and gas are introduced. Wave propagation in the lines is described. The frequency response of various system elements (hydropneumatic accumulators, expansion tanks, lines,

etc.) is portrayed by mathematical models which are available as computer codes. Computerized simulation of complex fluidic circuits is briefly described and practical applications are suggested. Author (ESA)

N82-21551# National Maritime Inst., Teddington (England).
BUFFETING OF CHIMNEY STACKS IN WINDS
J. R. Richardson Jun. 1980 18 p refs Presented at the North East Coast Inst. of Engr. and Shipbuilders, 10 Mar. 1980
(NMI-R-80) Avail: NTIS HC A02/MF A01

When chimneys are erected adjacent to one another, the vortices in the wake of a windward chimney can cause buffeting forces on another stack. Strakes are ineffective as a cure to this type of oscillation, therefore dampers were designed to limit this resonant response. Such a damper consists of a ring suspended from three points around the top of the stack, and incorporates telescopic shock absorbers. Its efficiency is very sensitive to the tuning of its natural frequency to that of the chimney. The chimney frequency must be determined accurately either by calculation or testing, and problems associated with this are discussed. At a given frequency, the deflection, slope, bending moment and shear force at one end of a constant section element can be found in terms of those at the other end, by multiplying by a fourth order matrix containing simple trigonometric and hyperbolic functions. Author (ESA)

N82-21552# National Maritime Inst., Teddington (England).
WAVE SLAMMING ON OFFSHORE STRUCTURES
B. L. Miller Mar. 1980 181 p refs Sponsored in part by DOE
(NMI-R-81; OT-R-81) Avail: NTIS HC A09/MF A01

Experimental and theoretical work on the slamming of circular cylinders is surveyed. Data are included from controlled drop tests. The influence of inclined impact and beam dynamics on the resulting stresses is calculated for a wide range of wave conditions. The statistical distributions of the estimated stresses are analyzed to provide data for the calculation of slamming loads on fixed offshore structures using simple formulas in which the slamming coefficients incorporate both the member dynamics and the sea wave statistics. Slamming coefficients and associated stress calculation methods are presented for extreme values and fatigue damage. These may also be used for slamming during jacket launching. A film of wave slam was also produced.
Author (ESA)

N82-21553# National Maritime Inst., Teddington (England).
RESPONSES TO SLOWLY VARYING DRIFT FORCES AND THEIR SENSITIVITY TO METHODS OF WAVE SPECTRAL MODELING: A PRELIMINARY ASSESSMENT
N. M. C. Dacunha, N. Hogben, and R. G. Standing Apr. 1981 29 p refs Sponsored by Ship and Marine Technology Requirements Board
(NMI-R-101; SMT-R-8103) Avail: NTIS HC A03/MF A01

The effects of the spacing of the discrete frequencies or spectral lines associated with the finite repeat periods which characterize laboratory simulations of sea waves are studied. An assessment of these effects and the related influence of spectral peakedness is made, using a ship model in a series of JONSWAP spectra and including some comparisons with experiment. The analytical results demonstrate the sensitivity of the responses and lead to suggested criteria for acceptable line spacing. The response spectrum and rms response are shown to vary with line spacing. Phase correlation and associated wave grouping are also treated. Author (ESA)

N82-21554# National Maritime Inst., Teddington (England).
WAVE LOADING ON OFFSHORE STRUCTURES: A REVIEW
R. G. Standing Feb. 1981 142 p refs Submitted for publication Sponsored by DOE
(NMI-R-102; OT-R-8113) Avail: NTIS HC A07/MF A01

Research relevant to design, particularly of deep water structures is reviewed. Morison's equation and forces on tubular members obtained from large scale experiments in the laboratory and at sea are discussed. Effects of marine growth and surface roughness, slamming on horizontal members, and vortex shedding (including lift forces) are considered. The wave diffraction method for estimating wave loads on members of large diameter and unusual shape and second order wave drift forces, affecting the low frequency response of structures and mooring loads, are included. Structural response and probabilistic methods, which are assuming a greater importance as dynamic loading and fatigue become more critical in design, are also covered. Author (ESA)

N82-21555# Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
NPDES COMPLIANCE FLOW MEASUREMENT MANUAL
David L. Guthrie Sep. 1981 149 p refs
(PB82-131178; MCD-77) Avail: NTIS HC A07/MF A01 CSCL 13B

Flow measurement is discussed in relation to waste water discharge and the determination of the quantity of waste water generated. There are four basic methods for determining flow: weighing the discharge, volumetric methods, sump pumps, and orifice buckets which are described. Other flow measurement techniques and devices are also presented. GRA

N82-21556 Iowa State Univ. of Science and Technology, Ames.
INDIRECT ESTIMATION OF PARAMETERS IN A FLEXIBLE TUBE, PULSATILE FLOW SYSTEM Ph.D. Thesis
Timothy Arthur Gray 1981 124 p
Avail: Univ. Microfilms Order No. 8128821

A mathematical model of pulsatile flow and pressure in a flexible tube with a possible branch and stenosis, or construction, was formulated. Solution of the model equations was performed by the finite element method and a numerical integration procedure. An in vitro experimental model of pulsatile flow in a flexible tube with a stenosis and a branch was devised to provide observed waveforms and directly measured vessel parameter values. The model response satisfactorily matched the experimental data and exhibited sensitivity to the parameters of interest: vessel compliance, peripheral resistance, and severity and location of the stenosis. The model response was not sensitive to the vessel radius. The Gauss-Newton algorithm was used to minimize the sum of squared error between model response and experimental waveforms by varying the model parameters.
Dissert. Abstr.

N82-21557 Illinois Univ. at Urbana-Champaign.
A THREE-DIMENSIONAL MAGNETOHYDRODYNAMIC DUCT FLOW IN A NON-UNIFORM MAGNETIC YIELD Ph.D. Thesis
John Claud Petrykowski 1981 105 p
Avail: Univ. Microfilms Order No. 8127669

The theory of three dimensional magnetohydrodynamic duct flows in uniform magnetic fields is well developed. A corresponding theory for non-uniform magnetic fields does not exist. This study represents the first analysis of a three dimensional MHD duct flow in which the magnetic field has spatial variations. A magnetic field is considered because it resembles the fringing field associated with a magnet's poles. In this way, the important problem of end effects can be modeled. The duct is an expansion with parallel, perfectly-conducting side walls and diverging, electrically insulating top and bottom walls. The problem is solved using boundary layer techniques via matched asymptotic expansions. Solutions for the core, Hartmann layer, intersection layer and side layer are determined. In particular, the analysis of the side layer problem centers on solving a formidable pair of coupled Fredholm integral equations. Dissert. Abstr.

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N82-21558*# National Aeronautics and Space Administration, Washington, D. C.
THERMAL COUPLING OF A HEAT FLUX SENSOR

Erwin Kaiser Mar. 1982 11 p refs Transl. into ENGLISH from Wissenschaftliche Zeitschrift (Dresden), v. 27, no. 3-4, 1978 p 743-746 Translation was announced as A78-49174 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by Technische Univ., Dresden
(Contract NASw-3542)
(NASA-TM-76700; NAS 1.15:76700) Avail: NTIS HC A02/MF A01 CSCL 14B

The conditions of thermal coupling were investigated in relationship to the development of sensors for local thermal flux measurements of component surfaces. The dependence of the transfer function on heat conductivity coefficient of the measured object and the influence of the contact resistance at the sensor boundaries are discussed in terms of known results and investigations. Author

N82-21559# Institut Royal Meteorologique de Belgique, Brussels.
CONTRIBUTION TO THE METROLOGICAL STUDY OF RADIOMETERS. A RADIOMETER TEST-CHAMBER
H. Boyen 1981 26 p refs
(Ser-A-100) Avail: NTIS HC A03/MF A01

A test-chamber especially equipped to study the dynamic behavior of radiometers and to calibrate pyrradiometers is described. Temperature as well as humidity and, to some extent, also ventilation speed inside of the test-chamber can be preset within fixed limits to simulate environmental conditions. Short-wave radiometers response may be controlled against a Xenon illuminator. The characteristics of two kinds of thermal radiators, viz. a cylindrical cavity and a large area cavity array, are discussed. An Eppley spectral precision pyranometer and a pyrradiometer of the shielded type have been tested to bring out the capabilities of the test-chamber. Author

N82-21560*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A CALIBRATION TECHNIQUE FOR A HOT-WIRE-PROBE VECTOR ANEMOMETER
James Scheiman, Charles Marple, and David S. Vann Mar. 1982 46 p refs
(NASA-TM-83254; NAS 1.15:83254; L-14445) Avail: NTIS HC A03/MF A01 CSCL 14B

Calibration tests using hot wires were conducted using a newly developed test rig that greatly reduced the data acquisition time. A comparison of measured and computed velocity vector magnitude and direction indicates the necessity of complete probe calibration to determine flow interference and/or operating limitation regions. Calibration results indicate that flow rates with 3 percent accuracy and flow angles with 5 deg accuracy are attainable. S.L.

N82-21561# Materials Research Labs., Melbourne (Australia).
DEVELOPMENT AND EVALUATION OF AN AUTOMATIC FRAGMENT-WEIGHING APPARATUS
N. M. Burman Dec. 1980 18 p refs
(MRL-R-803) Avail: NTIS HC A02/MF A01

An electromechanical system was designed and built to automatically measure and record the weights of large numbers of small fragments produced during the explosive testing of material. The results of the automatic weighing of fragments from several test cylinders are shown to compare favorably with those obtained by manual weighing. Author

N82-21562# Materials Research Labs., Melbourne (Australia).
AN INVESTIGATION OF THE RELIABILITY AND SENSITIVITY OF A POLARIZING VISIBILITY METER
R. P. Rubinfeld and S. E. Jenkins Oct. 1980 19 p refs
(MRL-TN-442) Avail: NTIS HC A02/MF A01

The performance of a 'veiling glare' type of visibility meter is studied in which the ratio of veiling glare to direct viewing is controlled by polarization. It was found that the detectability of standard reference targets was a function of shape as well as contrast. For this reason, and because of better reproducibility, it is recommended that gratings of different contrast rather than small spots be used as standard reference targets. As a result of experience with this instrument it is recommended that the field of view of the field visibility meter which is being designed be increased to at least 25 deg. Author

N82-21563# United Technologies Research Center, East Hartford, Conn. Optics and Acoustics Group.
OPTICAL HETERODYNE STRAIN SENSOR Final Report, Sep. 1980 - Aug. 1981
Karl A. Stetson and Robert K. Erf Wright-Patterson AFB, Ohio AFWAL Sep. 1981 69 p refs
(Contract F33615-80-C-2067; AF Proj. 3066)
(AD-A110288; UTRC/R81-995310; AFWAL-TR-81-2088) Avail: NTIS HC A04/MF A01 CSCL 17/8

It has been demonstrated that heterodyne optical strain sensing can be used to measure both static and vibratory strains to a range of 2000 microstrain with a sensitivity approaching one microstrain and an accuracy approaching one percent. The theoretical and experimental work undertaken to develop a heterodyne optical strain sensing system, as described herein, includes: 1) the fabrication of a prototype device; 2) a system evaluation study; and 3) application to a beam, turbine blade and crack detection. In addition to a detailed discussion of the results, the principles of heterodyne optical strain measurements, as originally conceived at the United Technologies Research Center, are presented. Author (GRA)

N82-21564# Royal Signals and Radar Establishment, Malvern (England).
AN AIRBORNE RECORDING SYSTEM FOR SECONDARY SURVEILLANCE RADAR (SSR) UPLINK SIGNALS
A. C. Fairhead London Jun. 1980 16 p refs Sponsored by Civil Aviation Authority
(RSRE-MEMO-3282; BR77105) Avail: NTIS HC A02/MF A01

A system for recording and displaying the signals reaching an aircraft from a secondary surveillance radar interrogator was developed. It can be used to study the characteristics of interrogators and their aerials, and also the effect of multipath interference on the uplink. A charge coupled device Fairchild CCD 321A-2 is used to compress the bandwidth of the signals so that an instrumentation tape recorder can record them. Digital circuitry generates fast and slow sampling clocks and applies them alternately to the CCD to achieve bandwidth compression. On being replayed, the signals are converted to digital form to enable a computer to display various features, e.g., video waveforms and polar diagrams. Author (ESA)

N82-21565# Royal Aircraft Establishment, Farnborough (England).
AN INTRODUCTION TO IMAGE PROCESSING AT ROYAL AIRCRAFT ESTABLISHMENT, FARNBOROUGH, ENGLAND
G. J. Davison London HMSO Sep. 1980 26 p refs
(RAE-TR-80107; RAE-SPACE-585; BR76808) Avail: NTIS HC A03/MF A01

Data collection and image processing for the generation of photographic products from SEASAT, LANDSAT, NIMBUS TIROS and METEOSAT 2 are described. The hardware facilities include a Linoscan 204 D composition device driven by a PRIME 200 computer, and a Plessey IDP 3000 interactive image display system. A disk based system enables the user to apply various processing algorithms to standard format data for display. Algorithms are described including: contrast enhancement by applying a mapping function to a set of pixel intensity values, a destriping algorithm which equates the means and variances of the radiance levels from each detector (LANDSAT), four principal components analysis, edge enhancement, and geometric transformations. Collaborative projects using remote sensing data by other government agencies are also mentioned. Author (ESA)

N82-21566# Royal Aircraft Establishment, Farnborough (England).
PICTURE ENHANCEMENT BY GREY SCALE MODIFICATION
M. R. McNaughton London HMSO Nov. 1977 21 p ref
(RAE-TM-AW-14; BR62183) Avail: NTIS HC A02/MF A01

Pictures were subjectively enhanced by adaptively modifying the gray scale rendition so that the occurrence of gray tones in each picture is approximately uniformly distributed over the available dynamic range. An infrared picture was photographed and the negative digitalized. A FORTRAN program was used to process the image data. A comparison was made between adaptive

and nonadaptive image processing. Image sharpness was slightly reduced as a result of the compression of tone differences between adjacent points. A spatial filtering program was used to enhance the edges. The real time implementation of the technique using a microprocessor to enhance moving TV pictures is briefly considered. Author (ESA)

N82-21567# Royal Aircraft Establishment, Farnborough (England).

AN INTERFACE BOARD FOR MONITORING THE OPERATIONAL STATUS OF A LINOSCAN FILM-WRITING MACHINE

A. P. Miller Jan. 1981 38 p refs
(RAE-TM-Space-282; BR78184) Avail: NTIS HC A03/MF A01

The design of a computer interface board which monitors and controls a modified Linoscan 204 scanner/generator, used in the production of photographic images from data stored on computer compatible tapes, is described. Data transfer is controlled by a Prime 200 computer using a general purpose interface board. This board also contains user designed interface logic, providing two way communication between the Linoscan and computer. Status data regarding bit rate, scan rate, etc., are loaded into the data buffers via a control pulse which is generated by a computer instruction. A block schematic of the data bases and a circuit diagram of the board are given. Author (ESA)

N82-21568# Statens Provningsanstalt, Boraas (Sweden). Kemisk Analys.

EVALUATION OF FILTER-TAPE ANALYZING DEVICES, PART 1 [UTVAERDERING AV FILTER-TAPEUTRUSTNING, ETAPP 1]

Eddie Aakesson 1979 25 p refs Partly in SWEDISH and ENGLISH 2 Vol.
(SP-RAPP-1979:22-Pt-1) Avail: NTIS HC A02/MF A01

Analyzers are discussed that are available for: toluenediisocyanate, methylenediisocyanate, organic isocyanates, H2S, phosgene, dinitrotoluene, HCl, Cl, SO2, NH3, NO2, vinyl chloride, hydrazine and toluenediamine. Filter-tape devices exist both in the transportable and in the portable form. Portable environmental measuring devices are now on the market for toluenediisocyanate, phosgene and hydrazine. Author (ESA)

N82-21569# Statens Provningsanstalt, Boraas (Sweden). Kemisk Analys.

EVALUATION PROGRAM FOR CARBON MONOXIDE METERS [UTVAERDERINGSPROGRAM FOER KOLMONOXIDMAETARE]

Eddie Aakesson, Goeran Stridh, and Bjoern Lundgren 1979 36 p refs In SWEDISH
(SP-RAPP-1979:23) Avail: NTIS HC A03/MF A01

Specifications are given for 25 devices, indicative of carbon monoxide meters and the three dosimeters available on the market. The indicating instruments belong to four types: electrochemical detection, semiconductor devices, detection by catalytic oxidation, and infrared spectroscopy. The operating principle of the detectors is described. The lowest scale available for the indicating instruments in generally 100 ppm, but there are electrochemical meters and IR instruments with a scale as lo ν as 10 ppm. The IR instruments are, as a rule, more sensitive than the devices with other detectors; they are also more expensive. Most of the meters operate in the 0.40 C temperature range and at a relative humidity of up to 90%. Author (ESA)

N82-21570# Statens Provningsanstalt, Boraas (Sweden).

WEAR TESTS FOR EXPLODING WIRES INSULATED WITH THERMOPLASTIC RESINS [SLITAGEPROV FOER TERMOPLASTISOLERAD ELSPRAENGKAPSELTRAED]

Janos Hetenyi 1979 14 p In SWEDISH
(SP-RAPP-1979:24) Avail: NTIS HC A02/MF A01

A method for testing the resistance of wire insulation to abrasion, scratching, rasping and honing is described. A triangle shaped rotating plate with an abrasive tape was used. The load on the test wire sample was adjustable. The breaking of the insulation was measured with an accuracy of 0.1 sec when an electric current passes through the wire. Data are given for five tests with exploding wires of 3 and 1.85 mm diameter. These tests were carried out at a temperature of 23 C. Author (ESA)

N82-21571# Statens Provningsanstalt, Boraas (Sweden). Kemisk Analys.

EVALUATION OF FILTER-TAPE ANALYZING DEVICES, PART 2 [UTVAERDERING AV FILTER-TAPEUTRUSTNING, ETAPP 2]

Eddie Aakesson, Goeran Stridh, and Bjoern Lundgren 1980 24 p ref In SWEDISH 2 Vol.
(SP-RAPP-1980:11-Pt-2) Avail: NTIS HC A02/MF A01

The use of the devices in places of work is surveyed. In Sweden, almost the only use of these devices is the recording of the toluene diisocyanate (TDI) content in the air, as a control in the handling of TDI in polyurethane foam manufacturing. Generally the users are satisfied with these analyzers. Data and application fields are reported for stationary and portable devices. Author (ESA)

N82-21572# National Physical Lab., Teddington (England). Div. of Electrical Science.

ON THE BASIC THEORY OF WATTMETERS SAMPLING AT REGULAR INTERVALS

J. R. Stockton and F. J. J. Clarke Aug. 1981 28 p refs
(NPL-DES-71; ISSN-0143-7305) Avail: NTIS HC A03/MF A01

The contribution to the errors of a regularly sampling wattmeter caused by using instantaneous samples of the input taken at equal intervals of time is evaluated. A significant number of harmonic autoproducts, and particularly of harmonic cross products, are not handled correctly. Sinusoidal waveforms are handled correctly, and the errors with near sinusoidal waveforms are negligible. Nonsinusoidal waveforms controlled by phase angle switching, and those associated with discharge lamps are examined. It is concluded that in practice errors can be substantially reduced by sample timing. Author (ESA)

N82-21573# National Physical Lab., Teddington (England). Dept. of Electrical Science.

DEVELOPMENT OF A MINIATURIZED PICOSECOND STREAK CAMERA. PART 1: CATHODE STABILITY AND INITIAL ELECTRODE DESIGN

A. G. Roddie, J. G. Edwards, T. Murphy (Photon Tubes Ltd.), and S. Maisey (Photon Tubes Ltd.) Oct. 1981 65 p refs
(Contract NPL-196/0064)
(NPL-DES-72-Pt-1; ISSN-0143-7305) Avail: NTIS HC A04/MF A01

The development of a stable S-1 photocathode for use at 1.06 microns in a streak camera with a time resolution better than 5 psec, high dynamic range, and low jitter is described. When response is satisfactory and stable, the cathodes are transferred to streak tubes. The streak tube was designed by computer modeling of the electron optics and electron trajectories to optimize temporal and spatial resolution. A 12% difference between theoretical and experimental focusing voltages is ascribed to finite electrode thickness or the effect of the glass envelope of the tube. The reduced field between the cathode and mesh impairs time resolutions and static test performance is satisfactory. Author (ESA)

N82-21574# Bureau of Radiological Health, Rockville, Md. Div. of Electronic Products.

A MICROPROCESSOR-BASED TRUE-RMS LINE VOLTAGE MONITOR Final Report

Jeffrey L. Silberberg Aug. 1981 78 p refs
(PB82-125022; DHHS/PUB/FDA-81-8179; FDA-BRH-81/110) Avail: NTIS HC A05/MF A01 CSCL 14B

A true-root-mean-square (RMS) line voltage monitor (LVM) was developed for use in determining compliance with the performance standard for diagnostic X-ray equipment. The instrument measures ac voltage with less than plus or minus 0.1 percent error over a wide range of voltage and frequency. It is compact and lightweight and thus suitable for field use. The theory of operation, system hardware and software, and performance characteristics of the true-RMS LVM. The true-RMS LVM is capable of measuring ac voltage and frequency over a frequency range of 16 to 1600 Hz. For RMS inputs between 60 and 650 V, the maximum voltage error is plus or minus 0.2 V over this frequency range. From 16 to 100 Hz, the RMS

value of the input voltage is computed for each cycle. The LVM is also capable of measuring dc voltage. GRA

N82-21575# National Bureau of Standards, Washington, D.C. National Engineering Lab.
HYDROCARBON VAPOR STANDARDS FOR PERFORMANCE EVALUATION OF COMBUSTIBLE GAS DETECTORS
James E. Brown Oct. 1981 21 p refs Sponsored in part by the National Inst. of Justice
(PB82-124702; NBS-SP-480-43) Avail: NTIS HC A02/MF A01 CSCL 14B

Mixtures of hydrocarbon vapor were evaluated for portable combustible gas detectors used to detect the presence of accelerant vapors in cases of suspected arson. The standards contain vapors of aliphatic and aromatic compounds common to petroleum distillates such as gasolines. The standards prepared by a dilution technique in which the vapor evolving from diffusion tubes containing liquid hydrocarbons is diluted with air. Gas chromatographic analyses of the vapor air mixtures that the vapor concentrations are essentially constant. GRA

N82-21576# National Bureau of Standards, Washington, D.C. Center for Electronics and Electrical Engineering.
SENSOR HANDBOOK FOR AUTOMATIC TEST, MONITORING, DIAGNOSTIC, AND CONTROL SYSTEMS APPLICATIONS TO MILITARY VEHICLES AND MACHINERY Final Report
Paul S. Lederer Oct. 1981 467 p refs Sponsored in part by Army Communications Research and Development Command, Ft. Monmouth, N.J.
(PB82-123746; NBS-SP-615; LC-81-600127) Avail: NTIS HC A20/MF A01 CSCL 14B

The handbook is intended as a guide for those who design, specify, use, and test military automatic test equipment containing sensors. The handbook addresses measurands and principles of measurement, data acquisition, sensor calibration and testing, environmental considerations, stability, durability, reliability, and error assessment. Sensor manufacturers and sensor calibration and evaluation resources are included as is an annotated bibliography. The handbook is based largely on the present, proved state-of-the-art. Possible future trends are briefly discussed. The handbook is addressed to the general engineer, system designer, or manager with an engineering background. It does not provide the highly detailed technical information needed by the measurement engineer, although ample references are included for further study. GRA

N82-21577# Monsanto Research Corp., Dayton, Ohio.
PORTABLE MINIATURE SAMPLER FOR POTENTIAL AIRBORNE CARCINOGENS IN MICROENVIRONMENTS: PHASE 2, EVALUATION Final Report, Nov. 1978 - Jun. 1981
D. S. West, F. N. Hodgson, J. J. Brooks, C. L. Heflin, and T. W. Hughes Sep. 1981 208 p refs
(Contract EPA-68-02-2774)
(PB82-129461; MRC-DA-1080; EPA-600/2-81-165) Avail: NTIS HC A10/MF A01 CSCL 14B

A portable sampling system was developed for the collection and concentration of a broad range of organic compounds from ambient air. The system is based on the use of three solid sorbent materials (Tenax-GC, Porapak R, and Ambersorb XE-340 arranged in series) through which air is drawn by a portable battery powered pump. Two different portable pumps (DuPont P4000 and Spectrex PAS 3000) were used to power the portable sampling device in field evaluations of the system. The system was evaluated in field studies conducted in Dayton, Ohio; Los Angeles, California; Houston Texas; Niagara Falls, New York; Research Triangle Park, North Carolina; and Cincinnati, Ohio. Both indoor and outdoor environments were included among those sampled. GRA

N82-21578# Bureau of Mines, Tuscaloosa, Ala.
POLYMERIC CONCENTRATION DETERMINED BY DRAG REDUCTION Report of Investigations, 1981
Jalna R. Zatko Sep. 1981 17 p refs
(PB82-128562; BM-RI-8559; LC-81-60701) Avail: NTIS HC A02/MF A01 CSCL 14B

An apparatus that is capable of measuring concentrations of high-molecular-weight polymers in solution at 10 ppm and less was developed. A means for determining low concentrations of polymeric solutions was devised that was independent of slight fluctuations in solvent quality in order to measure polymers in effluent prior to recycling of the recovered solution. The concentrations of polymers are related to a measured pressure drop observed during turbulent flow of the solution. Low concentrations of polymers of ethylene oxide and acrylamide (frequently used as flocculants for clay waste systems) in aqueous and salt solutions have been successfully measured on the apparatus constructed by the Bureau. GRA

36 LASERS AND MASERS

Includes parametric amplifiers.

N82-21579# Dayton Univ., Ohio. Research Inst.
ADSORPTION AND ADHESION ON LASER WINDOWS Final Technical Report, 1 Jun. 1978 - 30 Sep. 1981
John T. Grant Dec. 1981 80 p refs
(Grant AF-AFOSR-3666-78; AF Proj. 2306)
(AD-A110429; UDR-TR-81-146; AFOSR-82-0002TR) Avail: NTIS HC A05/MF A01 CSCL 20/12

A procedure to prepare uncontaminated calcium fluoride surfaces was developed. Characterization of the chemical composition and cleanliness of selected surfaces was performed with Auger electron spectroscopy (AES) and ion scattering spectroscopy (ISS). Electron beam-induced decomposition of the calcium fluoride was observed when using typical AES electron beam parameters (5 keV, 5 microamperes). Threshold measurements for the onset of electron beam damage showed that AES analysis could be made without significantly altering the chemical composition of the surface by rastering a 2.5 keV electron beam with a current density less than 0.16 mA/sq cm. The adsorption of water on clean calcium fluoride surfaces was studied using ISS. Room-temperature exposure to > 10L of water resulted in a saturated surface coverage of about a 1/4 monolayer. At a surface temperature of T sub SF = 180 K and a water pressure of 1.3 x ten to the -6th Pa, a coverage of one monolayer occurred almost instantaneously. Desorption of the adsorbed water was found to depend upon the surface temperature of the specimen prior to water exposure which suggests perhaps two different states of adsorption. The heat of adsorption of water on argon sputter cleaned calcium fluoride was determined to be 10.8 + or kcal/mole. GRA

N82-21580# Naval Research Lab., Washington, D. C.
THE THREE-DIMENSIONAL NON-LINEAR THEORY OF THE FREE ELECTRON LASER IN THE AMPLIFYING CONFIGURATION Interim Report
P. Sprangle and Cha-Mei Tang 28 Dec. 1981 45 p refs
(ARPA Order 3817)
(AD-A110227; NRL-MR-4663) Avail: NTIS HC A03/MF A01 CSCL 20/5

This paper presents a self-consistent non-linear treatment of the finite transverse dimensional effects associated with (1) the wiggler field, (2) the electron beam and (3) the radiation beam of the free electron laser (FEL) in a steady state amplifying configuration. Our formulation incorporates various efficiency enhancement schemes. A linearly polarized magnetic wiggler is used for our formulation. The inherent gradient of the magnetic wigglers in the transverse direction introduces betatron oscillations, which cause an increase in the effective axial beam temperature. The radiation beam in the presence of the electron beam and the magnetic wiggler experience diffraction as well as refraction effects. We find that the 3-D effects can lead to substantial differences in the effects compared to the 1-D theory. Finally a 3-D numerical illustration of a 10.6 micron FEL is given. Author (GRA)

N82-21581# Northrop Research and Technology Center, Palos Verdes Peninsula, Calif.
SCALING STUDIES ON EFFICIENT RAMAN CONVERTERS Technical Report, 21 Mar. 1980 - 20 Mar. 1981
H. Komine, E. A. Stappearts, S. J. Bronsna, and J. B. West

Arlington, Va. DARPA 1 Dec. 1981 54 p refs
(Contract N00014-80-C-0442; NR Proj. 395-706; DARPA Order 3125)
(AD-A110159; NRTC-82-2R) Avail: NTIS HC A04/MF A01 CSCL 20/5

Injection locking performance of a 1 micro sec XeF laser pulse and Raman converter scaling have been investigated. Narrowband ultraviolet radiation from a frequency-doubled dye laser has been used to control the linewidth and polarization of a long pulse-length electron beam-excited XeF laser. Linewidths of 0.004 nm have been achieved in the 353 nm band of the XeF (B yields X) Laser transition. Over 90% of the energy in the free-running laser pulse has been extracted in the narrowband injection-locked pulse. Ratios of injection signal power to output laser power on the order of .00001 are adequate for efficient injection-locking to occur. Efficient Raman conversion of microsecond-pulse, injection-locked XeF (353 nm) laser radiation into the blue-green region via the second Stokes shift in hydrogen has been demonstrated using a Raman oscillator-amplifier scheme. Strong depletion of the pump and the first Stokes radiation accompanied by a dominant second Stokes (500 nm) output was observed for the first time. Amplifier power conversion efficiency of 43% was achieved along with a blue-green output energy of 1.7 J at an energy efficiency of 34%. These data support Raman converter scaling analyses which predict feasibility of efficient XeF-to-blue-green conversion at higher energies.
Author (GRA)

N82-21582# TRW Defense and Space Systems Group, Redondo Beach, Calif.
FREE ELECTRON LASER THEORETICAL STUDY Final Report, 1 Jul. 1980 - 30 Sep. 1981
M. Zales Caponi, C. Shih, J. Dawson (California Univ. at Los Angeles), T. Lin (California Univ. at Los Angeles), and K. Whang (California Univ. at Los Angeles) 30 Nov. 1981 110 p refs
(Contract F49620-80-C-0079; AF Proj. 2301)
(AD-A110306; FEL-27R; AFOSR-81-0889TR) Avail: NTIS HC A06/MF A01 CSCL 20/5

This is the final report of the Free Electron Laser Theoretical Study carried out by TRW for the AFOSR during the period July 80 to September 81. Four distinct but interrelated problems that play an important role in the characteristics of a Free Electron Laser oscillator were investigated: (1) Transverse Effects: The effect of wiggler field inhomogeneity as well as the influence of different transverse profiles of the signal field and the electron beam on the FEL characteristics were studied in detail. A dramatic decrease in gain and efficiency is found with increasing value of the ratio of electron beam radius to photon beam radius. (2) Small Signal (SS) Gain: A1-D investigation of the small signal gain for a Tapered Wiggler Free Electron Laser was performed analytically for cold electron beams and numerically for cold and warm electron beams. It was found that the small signal gain spectrum shifts and decreases in amplitude as a function of increasing wiggler taper. (3) Multicomponent Wiggler Free Electron Laser (MCWFEL): The results from (1) and (2) motivated the development of a new FEL configuration that could have high small signal gain and sufficiently high efficiency at high powers with nearly the same output frequency. The new FEL is a combination of several wiggler components. (4) Finite Pulse Length Simulations and Kinetic Effects of Trapped Particle Instabilities in Free Electron Lasers: A 1-D finite pulse code was developed and the effects of pulse slippage detrapping of electrons at the beam edge and parasitic instabilities investigated for a tapered wiggler Free Electron Laser. Author (GRA)

N82-21583# National Physical Lab., Teddington (England). Div. of Electrical Science.
THE MODIFICATION AND CALIBRATION OF A THERMOELECTRIC RADIOMETER FOR POWER MEASUREMENTS AT SUBMILLIMETER WAVELENGTHS
T. G. Blaney and D. G. Moss Oct. 1980 42 p refs
(Contract DAAH03-79-M-5280; NPL-89/0483)
(NPL-DES-68; ISSN-0143-7305) Avail: NTIS HC A03/MF A01

A commercial thermoelectric disk radiometer (model 17S Laser Instrumentation Ltd.), designed for CW power measurements in the visible and near infrared region was modified by increasing the paint thickness on the disk. Interferometric techniques were used to measure the reflectivity of the disk and calibration was performed with an electrically calibrated thermopile. By correcting for power reflected by the radiometer target, power calibrations can be applied to the instrument with uncertainties estimated at + or 12% at wavelengths from 1 mm to 0.2 mm, and + or - 20% at wavelengths to 3 mm. The modified radiometer has a target diameter of 27 mm, a time constant of 14 sec and a noise equivalent power of 20 microwatts. Author (ESA)

N82-21584# National Physical Lab., Teddington (England). Div. of Quantum Metrology.
ORDERED LIST OF OPTICALLY-PUMPED LASER LINES (CONTINUOUS, LAMBDA GREATER THAN 9 MICRONS)
D. J. E. Knight 1981 28 p refs
(NPL-QU-45; ISSN-0309-3050) Avail: NTIS HC A03/MF A01

Sources of coherent, continuous wave (CW) radiation in the far infrared region of the spectrum are presented. All known CW laser lines with wavelengths longer than 9 microns are listed in order of decreasing wavelength. For each line the uncertainty of the wavelength (or frequency) measurement is given, and the frequency in MHz is also given, rounded to an appropriate number of significant figures. The lasing gas, the approximate power of the line, the relative polarization with respect to the pump radiation and the pump line wavelength, gas and line number, power threshold, and offset from line center in MHz are given. Up to three literature references are given, first for the wavelength or frequency measurement, then for other properties such as CW power, polarization, etc. Author (ESA)

N82-21585# Max-Planck-Gesellschaft zuer Foerderung der Wissenschaft e.V., Garching (West Germany). Projektgruppe fuer Laserforschung.
INVESTIGATIONS ON MOLECULAR HALOGEN LASERS: FLUORESCENCE SPECTROSCOPY, REACTION KINETICS AND LASER EXPERIMENTS [UNTERSUCHUNGEN AN MOLEKULAREN HALOGENLASERN: FLUORESZENZ-SPEKTROSKOPIE, REAKTIONSKINETIK UND LASEREXPERIMENTE]
M. Diegelmann Aug. 1980 127 p refs In GERMAN; ENGLISH summary
(PLF-33) Avail: NTIS HC A07/MF A01

Transitions (D' to A') from an ionically bound upper level to a covalent lower state in diatomic halogen molecules were experimentally and theoretically investigated. Experimentally, mixtures of various halogen donor compounds and a rare gas buffer were excited with a short pulse relativistic electron beam. Resulting fluorescence and laser emissions were measured spectrally and were temporally resolved. Laser experiments were carried out in a discharge pumped TEA laser setup, too. Unknown D' to A' transmission wavelengths for the interhalogen molecules were predicted, using a semiempirical model. Complications in the formation kinetics of interhalogen laser molecules are qualitatively discussed. It is demonstrated that the concept of the ionic-to-covalent D' to A' laser transition found in homonuclear diatomic halogens can also be applied to interhalogen molecules. Author (ESA)

N82-21586# National Physical Lab., Teddington (England). Div. of Quantum Metrology.
ORDERED LIST OF FAR INFRARED LASER LINES (CONTINUOUS, WAVELENGTH > 12 MILLIMICRONS)
D. J. E. Knight Feb. 1981 39 p refs Revised
(NPL-QU-45-Bev; ISSN-0309-3050) Avail: NTIS HC A03/MF A01

Lines are listed in order of wavelength, with references, power level and pump information. For each line the best available wavelength measurement or a frequency measurement is given, together with its fractional uncertainty, usually a single standard deviation. The list is intended as a radiation source list rather than as a frequency standards list. Improvements in accuracy within the Doppler tuning width are not necessarily shown.
Author (ESA)

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N82-21587* National Aeronautics and Space Administration. Pasadena Office, Calif.

SUSPENSION SYSTEM FOR A WHEEL ROLLING ON A FLAT TRACK Patent

Houston D. McGinness, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 24 Nov. 1981 11 p Filed 17 Nov. 1978 Supersedes N79-12446 (17 - 03, 0333) Sponsored by NASA

(NASA-Case-NPO-14395-1; US-Patent-4,301,740; US-Patent-Appl-SN-961833; US-Patent-Class-105-1A; US-Patent-Class-105-171; US-Patent-Class-105-180; US-Patent-Class-105-218R; US-Patent-Class-248-425; US-Patent-Class-104-83) Avail: US Patent and Trademark Office CSCL 13I

An improved suspension system for an uncrowned wheel rolling on a flat track is presented. It is characterized by a wheel frame assembly including a wheel frame and at least one uncrowned wheel connected in supporting relation with the frame. It is adapted to be seated in rolling engagement with a flat track, a load supporting bed, and a plurality of flexural struts interconnecting the bed in supported relation with the frame. Each of said struts is disposed in a plane passing through the center of the uncrowned wheel surface along a line substantially bisecting the line of contact established between the wheel surface and the flat surface of the truck and characterized by a modulus of elasticity sufficient for maintaining the axis of rotation for the wheel in substantial parallelism with the line of contact established between the surfaces of the wheel and track.

Official Gazette of the U.S. Patent and Trademark Office

N82-21588# Materials Research Labs., Melbourne (Australia).

SLOW SPEED MACHINING OF TITANIUM

D. M. Turley Oct. 1981 33 p refs

(MRL-R-833) Avail: NTIS HC A03/MF A01

Catastrophic-shear type chips were produced in machining titanium. These were shown to be formed by a cyclic process of indentation and catastrophic shear. The deformation within the chip was very heterogeneous with most of the deformation occurring in narrow shear bands between the segments. A model of chip formation was proposed based on orthogonal planning and machining in the scanning electron microscope. Cracking was observed to be associated with the shear bands and the degraded surface finish. The change to a continuous chip at low cutting speeds was not observed, however, the surface finish further deteriorated. Decreasing the depth of cut, rake angle, or using tools having a large nose radius made the chip less segmented and consequently improved surface finish. The depth of deformation beneath the machined surfaces increased with increasing depth of act and decreasing rake angle, while machining with a lubricant decreased the depth of deformation.

M.D.K.

N82-21589# Battelle Columbus Labs., Ohio.

COMPUTER AIDED DESIGN AND MANUFACTURING (CAD/CAM) TECHNIQUES FOR OPTIMUM PREFORM AND FINISHING FORGING OF SPIRAL BEVEL GEARS, PHASE 1 Final Report, Jun. 1979 - Apr. 1981

T. Schultes, P. S. Raghupathi, Taylan Altan, A. Badawy, T. Wassel, and J. Chevalier Warren, Mich. Army Tank-Automotive Command Aug. 1981 260 p refs

(Contract DAAK30-79-C-0071)

(AD-A110326; TACOM-TR-12586) Avail: NTIS HC A12/MF A01 CSCL 09/2

In Phase 1 of this program, a general purpose CAD/CAM techniques was developed for producing precision-forging dies for the family of spiral bevel gears. This CAD/CAM method uses the following input data: the specifications and overall dimensions of the spiral bevel gear to be produced; data on billet material under forging conditions; friction shear factor, describing the friction shear stress at die-material interface; and forging conditions, i.e., temperatures and deformation rates. GRA

N82-21590# Army Cold Regions Research and Engineering Lab., Hanover, N. H.

PREDICTING WHEELED VEHICLE MOTION RESISTANCE IN SHALLOW SNOW

George L. Blaisdell Dec. 1981 23 p refs

(DA Proj. 4A7-62730-AT-42)

(AD-A110134; CRREL-SR-81-30) Avail: NTIS HC A02/MF A01 CSCL 13/6

A vehicle traveling through snow is required to expend a greater amount of energy than is necessary when traveling on a rigid surface. Visually, this energy difference can be explained by the formation of a rut. Various attempts have been made in the past to equate the energy of compaction to vehicle motion resistance. However, many of the previous models use information gathered through the application of a vertical force (with a plate-sinkage device), to predict the horizontal motion resisting force. In an attempt to more accurately quantify the relationship between snow compaction and vehicle motion resistance, a vectorial analysis of compaction by a wheel is performed. A method for separating the compaction due to vehicle weight and forward thrust (horizontal propulsion) is suggested. Two methods of using this compaction force breakdown with field-generated data are proposed for the calculation of vehicle motion resistance in shallow snow. Author (GRA)

N82-21591# Curtiss-Wright Corp., Wood-Ridge, N.J. Power Systems Div.

HIGH-TEMPERATURE-TURBINE TECHNOLOGY PROGRAM. PHASE 2: TECHNOLOGY TEST AND SUPPORT STUDIES. REFERENCE TURBINE SUBSYSTEM DESIGN: PHASE 2 REPORT

Jun. 1981 92 p refs

(Contract DE-AC01-76ET-10348)

(DE81-030059; CW-WR-76-020.74A; FE-2291-74A) Avail: NTIS HC A05/MF A01

The design and operation of a gas turbine and combustor for a combined cycle power plant to be run on coal derived fuels and with turbine inlet temperatures of 2600 to 3000 F are described. The turbine subsystem design, i.e., blades, vanes, shaft, bearings, etc. are emphasized. Materials selection information and heat transfer analyses are included. DOE

N82-21592# Defence Research Information Centre, Orpington (England).

SIMULATION OF RAPIDLY VARYING LOAD CHARACTERISTICS OF A DIESEL ENGINE DRIVING A GENERATOR

Takeshi Miki, Tsutomu Nakatsuka et al Dec. 1980 26 p refs Transl. into ENGLISH of Hitachi Zosen Giho (Japan), v. 39, no. 4, 1978 p 224-229

(DRIC-T-6277; BR77081) Avail: NTIS HC A03/MF A01

A mathematical model for a four stroke diesel engine driving a generator is described, and results of calculations of engine behavior under sudden load changes are compared with test bed results. The speed variation of turbocharged four stroke diesel engines during rapid loadings is greater than of conventional engines. There are two reasons for this: (1) is the transient lack of air for combustion delivered from the turbocharger due to the larger moment of inertia of the rotor; (2) the smaller moment of inertia of the engine and generator caused by recent compact designs. The transient characteristics of the engine before beginning the design of the system are outlined. A good agreement between calculations and measurements was obtained.

Author (ESA)

N82-21593# National Engineering Lab., East Kilbride (Scotland). Flow Measurement Div.

THE DESIGN OF FLOW STRAIGHTENER/NOZZLE PACKAGES FOR ACCEPTANCE TESTING OF AIR COMPRESSORS AND EXHAUSTERS

K. A. Blake, F. C. Kinghorn, and R. Stevenson Jan. 1981 32 p refs Sponsored by Metrology and Standards Requirement Board

(NEL-673) Avail: NTIS HC A03/MF A01

A test rig was developed which incorporates two perforated plates as flow straighteners at particular positions. An uncertainty of 2% in the flow measurement was shown to be practicable under steady flow conditions using an uncalibrated standardized nozzle. A perforated plate design is shown which is more effective

than the design currently recommended. For testing on the inlet side of a compressor, nozzles may be installed as close as 8D to the intake without causing the uncertainty in the measured flow rate to rise above 2%. These results were obtained on nozzles of diameter ratio 0.42 so the conclusions cannot be applied to nozzles of larger area ratio. Author (ESA)

N82-21594# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium). Construction Mecanique Section.

ASSURING DIMENSIONAL PRECISION DURING CYLINDRICAL PLUNGE GRINDING BY KNOWING THE EVOLUTION OF THE TEMPERATURE FIELD IN THE WORKPIECE [MAITRISER LA PRECISION DIMENSIONELLE EN RECTIFICATION CYLINDRIQUE EN PLONGEE PAR LA CONNAISSANCE DE L'EVOLUTION DU CHAMP DE TEMPERATURE DANS LA PIECE]

Richard Aerens Mar. 1981 33 p refs In FRENCH Sponsored by Inst. pour l'Encouragement de la Recherche Scientifique dans l'Industrie et l'Agriculture

(CRIF-MC-69) Avail: NTIS HC A03/MF A01

A thermodynamic formula was derived by which the thermal expansion of a workpiece can be known during the grinding cycles of finishing processes. Application of the formula in order to optimize material removal rate is discussed. The thermodynamics of heat tranfer during grinding, with and without a cooling stream, were established. A thermal model is presented, and calculation of the variation in the temperature field of workpieces of different geometries for one grinding cycle is explained. A measurement method which gives the amount of heat penetrating into a workpiece as well as the coefficient of convection is then shown. Comparisons of measured temperatures and calculated temperatures for various grinding conditions demonstrate agreement, the difference always being < 2 C.

Author (ESA)

N82-21595# Statens Provningsanstalt, Boraas (Sweden). Kemisk Analys.

EVALUATION PROGRAM FOR PORTABLE SAMPLING PUMPS, PART 1 [UTVAERDERINGSPROGRAM FOER PERSONBURNA PROVTAGNINGSPUMPAR. ETAPP 1]

Eddie Aakesson, Goeran Stridh, and Bjoern Lundgren 1979 33 p refs Partly in SWEDISH and ENGLISH

(SP-RAPP-1979:20-Pt-1) Avail: NTIS HC A03/MF A01

A market inquiry is reported, with the constructors' data and the principal characteristics and performances of the pumps. The necessary and the desirable specifications are also presented. The available pumps vary in weight from 290 to 1370 g including the electric battery; the highest flow rate is 4 l/min and the highest pressure drop about 625 mm of water. Sampling time varies from 8 to 20 hours. It is very difficult to compare the different pumps existing on the market.

Author (ESA)

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N82-21596*# Fort Lewis A&M Coll., Durango, Colo.

THE EXTENSION OF THE THERMAL-VACUUM TEST OPTIMIZATION PROGRAM TO MULTIPLE FLIGHTS

Raymond E. Williams and John Byrd Jul. 1981 49 p refs (Grant NAG5-1)

(NASA-CR-166779; NAS 1.26:166779) Avail: NTIS HC A03/MF A01 CSCL 14D

The thermal vacuum test optimization model developed to provide an approach to the optimization of a test program based on prediction of flight performance with a single flight option in mind is extended to consider reflight as in space shuttle missions. The concept of 'utility', developed under the name of 'availability', is used to follow performance through the various options encountered when the capabilities of reflight and retrievability of space shuttle are available. Also, a 'lost value' model is modified to produce a measure of the probability of a mission's success, achieving a desired utility using a minimal cost test strategy. The resulting matrix of probabilities and their associated costs provides a means for project management to evaluate various test and reflight strategies. J.M.S.

N82-21597# Rolls-Royce Ltd., Derby (England). Aero Dept.

PRODUCT ASSURANCE IN THE 1980'S

A. G. Bowling 1980 7 p Presented at 6th John Loxham Lecture, England Submitted for publication

(PNR-90037) Avail: NTIS HC A02/MF A01

The importance of product assurance in disciplines outside manufacturing is discussed, particular emphasis being given to engineering and product support. The professional in the prime functions must realize that he is in charge of the problem and that it is his duty to minimize resource losses. An ethical approach including pride in one's job, training audits, and the importance of listening to the people doing the work is required. The rate at which technology is used in everyday situations is challenged. Objectives are suggested to help people to understand their problems, but not do their jobs for them. Managing directors, chief engineers, operators, plant managers and draftsmen are the most important numbers of the product assurance profession. Author (ESA)

N82-21598# British Aerospace Aircraft Group, Preston (England).

A CRITICAL REVIEW OF LIFE PREDICTION METHODS FOR COMPOSITE STRUCTURES Summary Report, 1 Nov. 1978 - 28 Feb. 1979

B. Gordon, R. S. Whitehead, and T. Sharples Feb. 1979 65 p refs

(Contract BAE-30H62/D/015)

(BAE-SON(P)-179) Avail: NTIS HC A04/MF A01

Miner's linear cumulative damage rule, used extensively to calculate safe fatigue lives for metallic structures, is shown to overpredict fatigue life and to be unsuitable for composite life prediction. An empirical modification of Miner's rule for each class of composite structural element, and the use of a load factor approach, are suggested. Published models with life prediction methods specifically developed for composite structures are classified into: empirical models (based on the strength life equal rank assumption), residual strength degradation models (requiring the same assumption and attempting to find an analytic equation for decrease in residual static strength), and (3) a mechanistic wear-out model which attempts to model accurately the fatigue failure process. The advantages and disadvantages of each type of model are assessed. The mechanistic wear-out model is shown to be the most flexible with the greatest potential for future development. Author (ESA)

N82-21599# Centre Technique des Industries Mecaniques, Senlis (France).

IMPROVEMENT OF AUTOMATIC INSPECTION THROUGH THE USE OF DATA PROCESSING. THE CASE OF ULTRASONIC INSPECTION BEING INTEGRATED INTO THE FABRICATION OF VALUABLE PARTS [AMELIORATION DU CONTROLE AUTOMATIQUE PAR L'EMPLOI D'UN TRAITEMENT INFORMATIQUE. CAS DU CONTROLE PAR ULTRASONS INTEGRE A LA FABRICATION DES PIECES DE VALEUR]

J. Rivenez 5 Dec. 1978 23 p In FRENCH

(CETIM-15-H-19-0-Pt-4) Avail: NTIS HC A02/MF A01

The possibilities and limitations of ultrasonic inspection are discussed and ways in which automatic data processing may be incorporated into control procedures are suggested. Ultrasonic fault detection is reviewed, including sorting and data analysis, all of which is often carried out manually. Advantages in automating this process are pointed out. A method whereby automatic ultrasonic fault detection can be integrated into the manufacture of parts on large forges is critically analyzed. Results are used to define a method of data acquisition and processing adapted to integrated fault detection during the fabrication of nonspecified valuable parts. It is noted that the equipment necessary for this implementation is not commercially available.

Author (ESA)

N82-21600# British Aerospace Aircraft Group, Kingston-upon-Thames (England). Ground Test Services Dept.

POSITRON ANNIHILATION
A. Turner Sep. 1980 8 p refs
(BAE-KGT-N-GEN-00996) Avail: NTIS HC A02/MF A01

A nondestructive investigative technique, using positron annihilation, is introduced, and the physics of it are explained. The collision of a positron and an electron under thermal conditions causes the emission of annihilation radiation in the form of two gamma rays. This radiation is detected using lithium drifted germanium or intrinsic germanium detectors. Applications are limited to quality control, where the very small detection area, (0.55 sq mm to a few sq cm) is not impractical, and to monitor areas with a known defect and following the progress of cracks. Whole aircraft or large component, scanning is not possible because of the enormous number of probes required.
Author (ESA)

N82-21601# Royal Aircraft Establishment, Farnborough (England).
NON-DESTRUCTIVE INSPECTION AND THE IMPLEMENTATION OF A DAMAGE TOLERANT DESIGN PHILOSOPHY
D. E. W. Stone Feb. 1981 15 p refs
(RAE-TM-Struct-982; BR78531) Avail: NTIS HC A02/MF A01

Increasing demands are being made for more quantitative NDI, but current inspection capabilities are inadequate. It is difficult to compare destructive and NDI data. Corrosion degrades inspection capability; 90% probability of detection of flaws with a 95% confidence bound is necessary, but only a 50% detection probability is attainable, for a 1/2 inch crack size, with a 95% confidence level. The implementation of a damage tolerant design philosophy requires a less subjective judgement to be made than is the case at present.
Author (ESA)

N82-21389 Purdue Univ., Lafayette, Ind.
COMMENTS ON ALUMINUM PARTICLE SIZE, AGGLOMERATION, AND ACCELERATION EFFECTS ON SOLID PROPELLANT BURNING BEHAVIOR
J. P. Renie and J. R. Osborn *In* APL The 18th JANNAF Combust. Meeting, Vol. 3 Oct. 1981 p 111-120 refs (For primary document see N82-21378 12-28)
(Grant AF-AFOSR-3381-77)
Avail: NTIS HC A20 CSCL 20/9

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N82-21602 Aeronautical Research Labs., Melbourne (Australia).
THE SIMULATION OF LOCAL STRESS-STRAIN BEHAVIOUR WITH APPLICATION FATIGUE ANALYSIS
R. C. Fraser 1981 25 p refs
(ARL/Struc-Rept-385) Copyright. Avail: Issuing Activity

A procedure that incorporates cyclic stress-strain concepts in a simulation of local stress and strain from nominal load using Neuber notch analysis is described in relation to its application to the fatigue analysis of in-service histories. In the present simulation the nonlinear stress-strain and Neuber equations are solved numerically rather than by piecewise approximations. For the long load histories occurring in practice this improves numerical stability.
B.W.

N82-21603*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PASCO: STRUCTURAL PANEL ANALYSIS AND SIZING CODE, CAPABILITY AND ANALYTICAL FOUNDATIONS
W. Jefferson Stroud and Melvin S. Anderson Nov. 1980 74 p refs Supersedes N81-27551
(NASA-TM-80181; NAS 1.15:80181) Avail: NTIS HC A04/MF A01 CSCL 20K

A computer code denoted PASCO which can be used for analyzing and sizing uniaxially-stiffened composite panels is described. Buckling and vibration analyses are carried out with a linked-plate analysis computer code denoted VIPASA, which is incorporated in PASCO. Sizing is based on nonlinear mathematical programming techniques and employs a computer code denoted CONMIN, also incorporated in PASCO. Design requirements considered are initial buckling, material strength, stiffness, and vibration frequency. The capability of the PASCO computer code and the approach used in the structural analysis and sizing are described.
J.M.S.

N82-21604*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COUPLED BENDING-BENDING-TORSION FLUTTER OF A MISTUNED CASCADE WITH NONUNIFORM BLADES
Krishna Rao V. Kaza (Toledo Univ.) and Robert E. Kielb 1982 20 p refs Presented at the 23rd Struct., Structural Dyn., and Mater. Conf., New Orleans, 10-12 May 1982
(NASA-TM-82813; E-1156; NAS 1.15:82813) Avail: NTIS HC A02/MF A01 CSCL 20K

A set of aeroelastic equations describing the motion of an arbitrarily mistuned cascade with flexible, pretwisted, nonuniform blades is developed using an extended Hamilton's principle. The derivation of the equations has its basis in the geometric nonlinear theory of elasticity in which the elongations and shears are negligible compared to unity. A general expression for foreshortening of a blade is derived and is explicity used in the formulation. The blade aerodynamic loading in the subsonic and supersonic flow regimes is obtained from two dimensional, unsteady, cascade theories. The aerodynamic, inertial and structural coupling between the bending (in two planes) and torsional motions of the blade is included. The equations are used to investigate the aeroelastic stability and to quantify the effect of frequency mistuning on flutter in turbofans. Results indicate that a moderate amount of intentional mistuning has enough potential to alleviate flutter problems in unshrouded, high aspect ratio turbofans.
S.L.

N82-21605# Lulea Univ. (Sweden). Div. of Structural Engineering.
DYNAMIC FAIL-SAFE BEHAVIOR OF STEEL STRUCTURES: THEORETICAL AND EXPERIMENTAL STUDIES OF SOME STEEL STRUCTURES IN THE AREA OF PRIMARY DAMAGE Ph.D. Thesis
Ulf Arne Girhammar 28 Mar. 1980 309 p refs
(Thesis-1980:06-D; ISSN-0348-8373) Avail: NTIS HC A14/MF A01

The fundamental behavior and the capacity of steel structures subjected to loss of interior load bearing elements are studied. The ultimate load bearing and deformation capacity of certain beam to column connections and the dynamic fail safe behavior of some ordinary steel structures are investigated in detail. A number of different geometrical models of steel structures in the area of primary damage are analysed. Both bending and catenary action of the models are treated and the strength properties of both members and connections are considered. Two types of connections are investigated, the bolted heel connection and the bolted end plate connection (with a degree of moment rigidity of 25%). No stability problems are treated. A rigid body method of analysis is applied.
R.J.F.

N82-21606# Lulea Univ. (Sweden). Div. of Soil Mechanics.
MECHANICAL PROPERTIES OF INORGANIC SILT Ph.D. Thesis
Lennart Boergesson 5 Jun. 1981 152 p refs
(Thesis-1981:09D) Avail: NTIS HC A08/MF A01

The properties of inorganic silt were investigated by means of laboratory tests, field tests and load tests. Drained and undrained shear strength parameters and their use for real cases of load were emphasized. The mechanisms of failure and the components of friction and shear strength are discussed. The influence of failure criteria, testing method, and rate of shear on the shear strength parameters were studied as well as the influence of clay content, plasticity index, deformation to failure, and stress history. The testing methods and parameters were checked with load tests in the field and in the loading basin.
S.L.

N82-21607# Materials Research Labs., Melbourne (Australia).
EXPERIMENTAL DETERMINATION OF STRESS INTENSITY IN A CRACKED CYLINDRICAL SPECIMEN
Graham Clark May 1980 16 p refs

(MRL-R-774; AR-002-157) Avail: NTIS HC A02/MF A01

The range of stress intensity at the tip of fatique crack is the major factor controlling the crack growth rate, and the relationship between these two parameters for any one material is easily established from crack growth rate measurements in a specimen geometry for which the stress intensity calibration is known. However, in a different specimen geometry made from the same material, different crack growth rates are observed, and it is possible to use this relationship to determine the stress intensity calibration for the second geometry from a comparison of crack growth rates in the two specimens. A stress intensity calibration procedure is described for a hollow cylindrical specimen containing a crack which grows radially from the bore under the influence of compressive loading across a diameter of the ring. The stress intensity determined experimentally is in close agreement with the results of a theoretical study. S.L.

N82-21608# Materials Research Labs., Melbourne (Australia).
THE MECHANISM OF STRENGTH LOSSES IN NYLON 6,6 PARACHUTE MATERIALS AFTER SALT WATER CONTAMINATION
G. T. Egglestone Nov. 1980 17 p refs
(MRL-R-801) Avail: NTIS HC A02/MF A01

Tensile strength losses in nylon 6,6 suspension lines contaminated with seawater resulted from abrasion damage due to salt crystals that penetrated the weave structure and caused shearing of the nylon filaments. This was contrary to a previous mechanism that attributed these losses to the increased local relative humidity and moisture uptake caused by deliquescent salts, in particular magnesium chloride ($MgCl_2.6H_2O$), present in seawater. Analysis using the Rheovibron Viscoelastometer showed that the presence of $MgCl_2.6H_2O$ on nylon 6,6 material does not increase the local relative humidity but decreases it, leaving the nylon in a drier state. Author

N82-21609# Materials Research Labs., Melbourne (Australia).
INSTRUMENTATION OF NATIONAL PHYSICAL LABORATORY FATIGUE TESTING MACHINE
N. J. Baldwin, D. S. Saunders, and N. M. Burman Dec. 1980 10 p
(MRL-TN-448) Avail: NTIS HC A02/MF A01

A National Physical Laboratory fatigue testing machine used for the fatigue precracking of Charpy sized test specimens was instrumented. It is possible to monitor crack growth electronically thereby reducing the operator's time in attendance at the machine from hours to minutes and improving the reproducibility of fatigue precracking. R.J.F.

N82-21610# Aeronautical Research Labs., Melbourne (Australia).
FLIGHT TRIAL OF THE AIRCRAFT FATIGUE DATA ANALYSIS SYSTEM (AFDAS) MK 2 PROTOTYPE
P. J. Howard 1981 33 p refs
(ARL/Struc-Note-466; AR-002-249) Avail: NTIS HC A03/MF A01

A prototype version of the Aircraft Fatigue Data Analysis System (AFDAS) was evaluated in flight trials by comparison with continuously recorded data. Over a limited period of test the range-mean-pairs count of strain cycles was the same for both sets of data, and the gains calculated for the AFDAS are identical to those deduced from the continuous record. Author

N82-21611*# Brown Univ., Providence, R. I. Center for Dynamical Systems.
PARAMETER ESTIMATION FOR DISTRIBUTED SYSTEMS ARISING IN ELASTICITY
H. T. Banks and J. M. Crowley Nov. 1981 25 p refs Presented at the NCKU/AAS Symp. on Eng. Sci. and Mech., Tainan, Taiwan, 28 Dec. 1981 - 1 Jan. 1982
(Contracts NAS1-15810; NAS1-16394; DAAG29-79-C-0161; Grants AF-AFOSR-3092-76; NSF MCD-79-05774)
(NASA-CR-168688; AD-A110225; LCDS-81-24)
AFOSR-81-0885TR) Avail: NTIS HC A02/MF A01 CSCL 20/11

The authors discuss parameter estimation techniques for distributed systems such as the Euler-Bernoulli and Timoshenko equations of elasticity. The methods are based on cubic and quintic spline approximation schemes formulated in the context of a general functional analytic framework for abstract equations in Hilbert spaces. A number of examples with numerical results are presented to demonstrate efficacy of the techniques. Author (GRA)

N82-21612# Northwestern Univ., Evanston, Ill. Dept. of Materials Science.
THE PLASTIC ZONE AND RESIDUAL STRESS NEAR A NOTCH AND A FATIGUE CRACK IN HSLA STEEL
W. H. Schlosberg and J. B. Cohen 16 Dec. 1981 55 p refs (Contract N00014-80-C-0116)
(AD-A109890; TR-5) Avail: NTIS HC A04/MF A01 CSCL 11/6

The plastic zone and residual stress around a notch under load and with the load removed, and around a fatigue crack (at the same stress intensity factor as for the notch) have been examined, with automated X-ray techniques and a microbeam. There is a good agreement between the measured plastic zone size and Hutchinson's theory for a work hardening material. Residual stresses exist well behind the tip, and vary with depth, so that measurements of crack closure on a surface may not be directly related to closure stress (which samples the bulk). Instabilities in the dislocation arrangement can be detected by comparing X-ray line broadening of bulk specimens under load, and with the load removed. Author (GRA)

N82-21613# Naval Civil Engineering Lab., Port Hueneme, Calif.
DESIGN PROCEDURES FOR EMBEDMENT ANCHORS SUBJECTED TO DYNAMIC LOADING CONDITIONS Final Report, Jul. 1974 - Sep. 1978
H. G. Herrmann Nov. 1981 76 p refs
(YF52557091)
(AD-A110325; NCEL-TR-888) Avail: NTIS HC A05/MF A01 CSCL 13/10

This report provides procedures for determining allowable design loads for embedment anchors under all types of dynamic loads, including impact (as from a ship driving into a mooring), cyclic (as from a buoy or ship riding in a mooring system during a storm), and earthquake loading. The design procedures are simplified in the form of guidelines applicable to most site conditions and are complete to the point of including the following: (1) site survey requirements; (2) detailed static design procedures; (3) description and definition of dynamic loads; (4) design procedures for impact, cyclic, and earthquake loading; (5) selection and use of appropriate factors of safety; and (6) description of available existing CEL embedment anchor hardware. While the procedures are designed specifically for the NCEL-developed family of propellant (often termed explosive) embedded anchors, they are applicable to other types of embedment anchors and screw anchors. GRA

N82-21614# National Physical Lab., Teddington (England). Div. of Materials Applications.
THE SOLUTION OF PLATE DEFLECTION PROBLEMS BY FINITE DIFFERENCE METHODS
A. Woolf and A. F. Johnson Jul. 1980 22 p refs
(NPL-DMA(A)14; ISSN-0143-7313) Avail: NTIS HC A02/MF A01

Finite difference methods are developed for determining the deflection of a rectangular plate under various loading conditions. The numerical solution for simply supported plates under uniform pressure and point loads is tested by comparison with known analytical solutions. The method is extended to clamped plates under similar loading conditions for which only a few analytical solutions are available. Techniques which can be applied to solve plate loading problems which arise in polymar and composite applications are emphasized. The finite difference method is shown to be tractable for this class of problem. Author (ESA)

N82-21615# National Engineering Lab., East Kilbride (Scotland). Strength of Components Group.
MODE 1 BRANCH CRACKS AND THEIR IMPLICATIONS FOR COMBINED MODE FAILURE
L. P. Pook Apr. 1980 26 p refs Sponsored by the Dept. of Industry's Engineering Materials Requirements Board
(NEL-667) Avail: NTIS HC A03/MF A01

Cracks in isotropic materials are observed to grow perpendicular to the maximum principal applied tensile stress, or in Mode 1. For cracks not initially oriented in the preferred direction,

prediction of failure involves finding criteria for the formation and propagation of Mode 1 branch cracks. No satisfactory criterion for the formation of Mode 1 branch cracks appears to exist, but, through an examination of stress intensity factors for branch cracks, an approximate, lower bound failure envelope for the general case of a crack inclined to the applied stress was constructed. Comparison with experiment is hampered by lack of general agreement on what constitutes a valid test for a specimen containing an inclined crack. Author (ESA)

N82-21616# Liege Univ. (Belgium). Lab. du Service De Resistance des Materiaux et Statique des Constructions.

EXPERIMENTAL DETERMINATION OF RESIDUAL STRESS IN A BEAM WITH DIAGONAL STIFFENERS [DETERMINATION EXPERIMENTALE DES CONTRAINTES RESIDUELLES DANS UNE POUTRE A RAIDISSEURS DIAGONAUX]

S. Cescotto and P. Boeraeve (Liege Univ.) Jan. 1981 30 p refs In FRENCH Sponsored by Inst. pour l'Encouragement de la Rech. Sci. dans l'Ind. et l'Agr.

(CRIF-MT-140) Avail: NTIS HC A03/MF A01

Residual stress distribution was determined in box beam. The dimensions of the beam are given along with its elastic limits and values for initial transversal deformation. A residual stress measurement method is then described. Results confirm the potential of this type of beam as a structural member. Residual stress has an important effect on strength characteristics, however, no method to calculate them as yet exists. The possibility of numerical simulation, using finite elements, is foreseen. Author (ESA)

N82-21617# Royal Aircraft Establishment, Farnborough (England).

CRACKS IN SHEETS HAVING STIFFENERS ATTACHED BY A SINGLE ROW OF RIVETS

D. J. Cartwright (Southampton Univ., England) London HMSO Oct. 1980 32 p refs

(RAE-TR-80122; RAE-Mat-407; BR77355) Avail: NTIS HC A03/MF A01

Complex variable techniques are used to analyze the problem of a crack in a large stiffened sheet subjected to uniform stress remote from the crack. The stiffeners are perpendicular to the crack and are each fixed to the sheet by a single row of rigid fasteners. The stress intensity factor of the crack, the forces at the points of attachment near the crack and the maximum load in each stiffener are derived. The dependence of these quantities on the stiffness and spacing of the stiffeners and on the spacing of the fasteners is evaluated for a crack located in the sheet either symmetrically between two stiffeners or symmetrically under a stiffener. When the crack extends under the stiffener two cases are considered; the stiffener broken or unbroken. Author (ESA)

N82-21618# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium). Section Construction Metallique.

DETERMINATION OF STEEL-CONCRETE ADHESION IN REINFORCED BEAMS [DETERMINATION DE L'ADHERENCE NATURELLE ACIER - BETON DANS LE CAS DE POUTRES MIXTES COMPOSEES D'UN PROFILE METALLIQUE ENROBE DE BETON]

Azarius Dobruszkes, S. A. Preflex, and Eugene Piraprez Mar. 1981 62 p refs In FRENCH Sponsored by Inst. pour l'Encouragement de la Rech. Sci. dans l'Ind. et l'Agr.

(CRIF-MT-142) Avail: NTIS HC A04/MF A01

Steel/concrete beams including flection on two support beams were tested by push out tests and pull out tests in columns. Different parameters were studied: the surface characteristics; the presence of connecting profiles; partial or total embedding; and adhesion surface; and quantity of steel reinforcement in the concrete. It is shown that the maximum adherence force can be taken as 20 kg/sq cm with a large safety margin. The number of connectors necessary in steel concrete beams can be consequently reduced by as much as 40 %. Author (ESA)

N82-21619# Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).

REVIEW OF INVESTIGATIONS ON AERONAUTICAL FATIGUE IN THE FEDERAL REPUBLIC OF GERMANY Review Report, May 1979 - Apr. 1981

O. Buxbaum and H. Lowak 1981 214 p refs Presented at 17th Intern. Comm. on Aeronautical Fatigue (ICAF) Conf., Noordwijkerhout, Netherlands, 1981

(LBF-S-159(1981)) Avail: NTIS HC A10/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 125

Results of investigations by industry and research organizations in the field of fatigue are summarized. Most reports concern fatigue test results from specimens and components under constant amplitude, programmed and random loading. Others concern the measurement and analysis of loading in service. Investigations on cyclic stress-strain behavior, crack propagation, fracture mechanics, and residual strength are included. Author (ESA)

N82-21620# Hochschule der Bundeswehr, Hamburg (West Germany). Fachbereich Maschinenbau.

DYNAMIC BEHAVIOR OF A DISK ON A FLEXIBLE SHAFT WITH A CROSS SECTIONAL CRACK Thesis

Juergen Meyer Nov. 1979 126 p refs In GERMAN; ENGLISH summary

(HSBw-Mitt-79/1) Avail: NTIS HC A07/MF A01

The vibrational behavior of the disk was numerically calculated and simulated on an analog computer, aiming at the control of shaft reliability in high performance machinery. The motions of a rotor consisting of a disk on a flexible cracked shaft with resulting nonlinear stiffness are described by piecewise linear differential equations. The vibrations caused by loss of balance and weight occur mainly periodically with the period of the driving frequency. Solutions are represented analytically and solved numerically. A first stability analysis was carried out for a simplified crack model. The stability limits are better calculated by numerical integration of the equations of motion. Further stationary vibrations were obtained by matching the analytical solutions. Ideas regarding possibilities of early detection of cross sectional cracks in flexible shafts are given. Author (ESA)

N82-21621# National Engineering Lab., East Kilbride (Scotland). Numerical Analysis and Computer Science Div.

THE USE OF NASTRAN FOR TRANSIENT ANALYSIS OF LINEAR AND NONLINEAR SYSTEMS IN STRUCTURAL DYNAMICS

J. M. Lovell Oct. 1980 44 p refs

(NEL-671) Avail: NTIS HC A03/MF A01

A feasibility study on the capability of the widely used MSC/NASTRAN structural analysis program to deal with initial value problems in second order differential equations is reported. It deals with the integration schemes recommended for systems where modal formulation is impossible. Scalar dynamic models were devised to test the algorithm's effectiveness in handling both linear and nonlinear systems, and the results were compared with closed-form theoretical solutions. Results show that linear dynamic systems have a limited range of incremental step lengths over which the integrated algorithm can give valid solutions. In nonlinear dynamic systems, numerical instability is a major problem. Author (ESA)

N82-21622# National Engineering Lab., East Kilbride (Scotland). Strength of Components Group.

LARGE SCALE SERVICE LOADING FATIGUE TESTING WITH PARTICULAR REFERENCE TO OFFSHORE STRUCTURES

K. J. Marsh Dec. 1980 28 p refs Presented at UK-USSR Select Sem. on Corrosion Fatigue, Lvov, USSR, May 1980

(NEL-672) Avail: NTIS HC A03/MF A01

A range of tests on welded steel tubular joints, as used in offshore jacket platforms, and parallel work on simpler cruciform welded joints are described. Testing in a seawater environment and the effect of various random loading stress histories appropriate to offshore structures are covered. Photographs of test procedures in operation are given. There are three different geometries of tubular joint in the program. All involve a chord member, which is usually of larger diameter, and one, two or three (usually smaller) brace members, the joints being described respectively as T joints, K joints and Kt joints. Three different modes of loading are investigated: axial loading in the brace member (with the chord free to bend and bulge); in-plane bending of the brace member with respect to

the chord; and out-of-plane bending. The largest test pieces have 1.8 m dia, 75 mm thick chord members. Author (ESA)

N82-21623# National Maritime Inst., Teddington (England).
WAVE LOADING IN THE DRAG AND INERTIA REGIMES: ROUTES TO DESIGN DATA
H. H. Pearcey and J. R. Bishop Sep. 1979 49 p refs Presented at BOSS 79 Conf. on Behaviour of Offshore Struct., Aug. 1979 Sponsored by DOE
(NMI-R-64; OT-R-7959) Avail: NTIS HC A03/MF A01

Parallel routes to design data are discussed which depend on small scale laboratory experiments and on large scale experiments in the real sea. The range of techniques being used for analyzing results from the Christchurch Bay tower is briefly reviewed. The complexity of the loading mechanisms and the variability of force coefficients and how this has been dealt with in the analysis and interpretation of the results is emphasized. Cooperation is suggested between designers and those engaged in deriving design data, especially those concerned with major projects, to bring all the knowledge together into the most appropriate design tools. Author (ESA)

N82-21624# National Maritime Inst., Teddington (England).
THE EFFECTS OF SURFACE ROUGHNESS ON THE WAVE LOADING FOR CYLINDRICAL MEMBERS OF CIRCULAR CROSS SECTION
H. H. Pearcey Sep. 1979 22 p refs Sponsored by DOE
(NMI-R-65; OT-R-7960) Avail: NTIS HC A02/MF A01

The data that relate the structural wave loading to the hard roughness in vertical cylindrical structures is reviewed. The effects of seaweed growth is also discussed. The difficulties in simulating or reproducing the surface conditions created by marine growth and the difficulty in achieving representative flow conditions at laboratory scales for tests in waves are commented upon. Wave loading is shown to significantly increase if the cylinder surface is rough; the force coefficient for a very rough surface can be of the order of twice that of a smooth cylinder. Further work is needed to provide data pertaining to full scale structures at sea with different types of fouling known to occur in the North Sea. Author (ESA)

N82-21625# National Maritime Inst., Teddington (England).
USE OF POTENTIAL FLOW THEORY IN EVALUATING WAVE FORCES ON OFFSHORE STRUCTURES
R. G. Standing Dec. 1979 51 p refs Presented at Inst. of Math. and its Appl. Conf. on Power from Sea waves, Edinburgh, Jun. 1979 Submitted for publication Sponsored by Dept. of Energy's Offshore Energy Technology Board and Wave Energy Steering Committee, and Ship and Marine Technology Requirements Board
(NMI-R-70; OT-M-7907) Avail: NTIS HC A04/MF A01

The prediction of wave loads on offshore structures and their response to that loading by a potential flow theory computer model is presented. A computer program for the linearized system solution is described. The program is based on the three dimensional Green's function approach. Results for one particular application, that of wave energy devices are presented. Good agreement is shown where the wave height is small or comparable with typical body dimensions. Author (ESA)

N82-21626# National Maritime Inst., Teddington (England).
AN EXPERIMENTAL INVESTIGATION OF MATHIEU INSTABILITIES ON TETHERED BUOYANT PLATFORM MODELS
S. J. Rowe and G. E. Jackson Jan. 1980 37 p refs Sponsored by Dept. of Energy's Offshore Energy Technology Board
(NMI-R-73; OT-R-8008) Avail: NTIS HC A03/MF A01

The Mathieu instability boundaries for four model configurations with varying vertical and horizontal added masses but constant displacement were investigated. One model with the highest vertical added mass, shows Mathieu instabilities in regular waves. A few tests were carried out on the same model without its payload and instabilities are also seen. The boundaries of instability were defined by measurement and agree with linear theory. Mathieu instabilities are not excited by second order wave forces in tests with modulated regular waves. Author (ESA)

N82-21627# National Maritime Inst., Teddington (England).
USE OF WAVE DIFFRACTION THEORY WITH MORISON'S EQUATION TO COMPUTE WAVE LOADS AND MOTIONS OF OFFSHORE STRUCTURES
R. G. Standing Sep. 1979 68 p refs Sponsored by Dept. of Energy's Offshore Energy Technology Board
(NMI-R-74; OT-R-7607) Avail: NTIS HC A04/MF A01

An improved computer program to calculate sea wave loads on fixed marine structures, based on wave diffraction theory, is described. Added mass and wave damping coefficients for small amplitude surge, heave, roll, pitch and yaw motions were computed. A linear analysis includes these coefficients, mooring constraints and hydrostatic terms, and predicts the rigid body response of the structure to given wave loading. Comparisons with model test data were limited in extent and showed the program to be useful if the drag force and the wave and motion amplitudes are not too large. Author (ESA)

N82-21628# Centre Technique des Industries Mecaniques, Senlis (France).
DETERMINATION OF DEFORMATIONS DUE TO THE FORMING OF THICK PLATES Final Report [DETERMINATION DES DEFORMATIONS ENGENDREES PAR LES OPERATIONS DE FORMAGE DES TOLES EPAISSES]
C. Bouhelier and Y. Marez Dec. 1980 112 p refs In FRENCH
(CETIM-13J091) Avail: NTIS HC A06/MF A01

Formulas for predicting the deformation of thick plates subjected to various forming techniques were verified and improved. By knowing expected deformation, boiler manufacturers can better judge the utility of post-forming heat treatments. Deformation of 29 boiler components was measured. Forming techniques considered were cold stamping, hot stamping, cold spinning, hot stamping followed by cold spinning, hot spinning on a forming machine, repeated cold stamping, and cold bending. Measured deformation is compared with calculated deformation. Revised formulas are given. Author (ESA)

N82-21629# Centre Technique des Industries Mecaniques, St. Etienne (France).
STRESS IN MECHANICAL LIFTS [SOLLICITATIONS DES REMONTEES MECANIQUES]
J.-P. Faurie Mar. 1981 19 p In FRENCH Original contains color illustrations
(CETIM-1-5K-44-1) Avail: NTIS HC A02/MF A01

The feasibility of determining the stresses that the different components of a mechanical ski lift (chair lift, gondola, etc.) must undergo during operation was studied. An on-site stress-strain measurement program is outlined and first results are summarized. It is recommended that the study be continued. Author (ESA)

N82-21630# Defence Research Information Centre, Orpington (England).
ACOUSTIC EMISSION AND CRACK-TIP PLASTICITY IN STRUCTURAL LOW-CARBON STEEL
S. Taira, K. Tanaka, and Y. Nakai May 1981 15 p refs Transl. into ENGLISH from ZAIRYO, (Japan), v. 28, no. 306, 1979 p 203-210
(DRIC-T-6275; GLS-2946; BR78969) Avail: NTIS HC A02/MF A01

Fracture toughness tests were conducted on compact flat plate tensile test specimens of structural low carbon steel with varied initial crack length. Simultaneously with the detection of acoustic emission, plastic deformation was observed in the sample ligaments. The relationship between plastic deformation and acoustic emission was studied. The plastic deformation is found to be heterogeneous deformation due to Luders deformation. The acoustic emission generation tendency in fracture toughness tests depends on the behavior in plastic deformation. When additional Luders bands form from the crack tip, increases and a Vrms peak is observed, but when the existing Luders bands grow and form from the crack tail and the compression side growth, Vrms peaks are not necessarily observed. Author (ESA)

N82-21631# National Maritime Inst., Teddington (England).
MONITORING THE TOW-OUT OF THE NMI CHRISTCHURCH BAY TOWER (10 APRIL 1978)

A. E. Wills Apr. 1981 13 p refs Sponsored by DOE
(NMI-R-107; OT-R-8134) Avail: NTIS HC A02/MF A01

Monitoring the required towing forces, and speed through the water, of the tower is described. Strain gages were inserted in the tug tow line. A trisponder and three shore stations were used to calculate speed over ground. Tidal stream velocity was derived from a drifting target having the same draught as the towed structure. The attempt failed when a second tug was added at short notice to push the structure and no adequate measuring system could be attached in time. Author (ESA)

N82-21632# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computer Science.
NUMERICAL DETERMINATION OF THE THREE-DIMENSIONAL EQUILIBRIUM CONFIGURATION OF AN UNDERWATER UMBILICAL SUBJECTED TO STEADY HYDRODYNAMIC LOADING
D. H. Ferriss Dec. 1981 47 p refs Sponsored by Offshore Energy Technology Board
(NPL-DNACS-50/81; OT-R-8143; ISSN-0143-7348) Avail: NTIS HC A03/MF A01

The nonlinear boundary value problem defined by the equilibrium equations and boundary conditions for a surface vessel, umbilical, submersible system was treated. Each dependent variable is defined as a finite Chebyshev series of which the coefficients are determined. Nonlinear cases are treated iteratively by solving a succession of linear problems. The solution is reached after a paying out of the umbilical and gradual increase in hydrodynamic loading. It is found that the Chebyshev selected points method gives satisfactory numerical solutions. Reasonable starting conditions, like zero weight, improve calculation efficiency. Author (ESA)

N82-21633# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
ON THE SOLUTIONS TO FORCED MOTIONS OF LAYERED COMPOSITE PLATES Interim Report
J. N. Reddy Sep. 1981 46 p refs
(Grant AF-AFOSR-0142-81)
(PB82-122367; VPI-E-81-24; AFOSR-81-0142TR) Avail: NTIS HC A03/MF A01 CSCL 20K

Transient response of layered, anisotropic composite plates is investigated using a shear-flexible finite element. Closed-form solutions are also presented for certain cross-ply and angle-ply plates. The Newmark direct integration technique is employed to solve the ordinary differential equations in time. Numerical results are presented showing the effect of plate side-to-thickness ratio, aspect ratio, material orthotropy, and lamination scheme on the transverse deflections and stresses of rectangular plates. Author

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

N82-21634* National Aeronautics and Space Administration, Washington, D. C.
EARTH RESOURCES: A CONTINUING BIBLIOGRAPHY (ISSUE 32)
Jan. 1982 135 p
(NASA-SP-7041(32); NAS 1.21:7041(32)) Avail: NTIS HC $10.50 CSCL 05B

This bibliography list 580 reports, articles and other documents introduced into the NASA scientific and technical information system. Emphasis is placed on the use of remote sensing and geophysical instrumentation in spacecraft and aircraft to survey and inventory natural resources and urban areas. Subject matter is grouped according to agriculture and forestry, environmental changes and cultural resources, geodesy and cartography, geology and mineral resources, hydrology and water management, data processing and distribution systems, instrumentation and sensors, and economic analysis. T.M.

N82-21635*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
REGISTRATION VERIFICATION OF SEA/AR FIELDS
Willa W. Austin and Lyle Lautenschlager, Principal Investigators Jun. 1981 42 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E82-10083; NASA-CR-161059; JSC-17251;
NAS 1.26:161059; EW-L1-04101; LEMSCO-16204) Avail: NTIS HC A03/MF A01 CSCL 02C

A method of field registration verification for 20 SEA/AR sites for the 1979 crop year is evaluated. Field delineations for the sites were entered into the data base, and their registration verified using single channel gray scale computer printout maps of LANDSAT data taken over the site. J.D.H.

N82-21636*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
GROUND REGISTRATION OF DATA FROM AN AIRBORNE SCATTEROMETER
John C. Richter Jun. 1981 27 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E82-10084; NASA-CR-161058; JSC-17296;
NAS 1.26:161058; SM-L1-04091; LEMSCO-16340) Avail: NTIS HC A03/MF A01 CSCL 02C

A portion of the data for the agricultural soil moisture experiment, conducted near Colby, Kansas, was collected from four scatterometers mounted on an aircraft. A method is outlined for locating the scatterometer footprints with respect to a ground-based coordinate system. The method requires the airplane's flight parameters along with aerial photography acquired simultaneously with the scatterometer data. Listings of the programs used in the registration process are included. A.R.H.

N82-21637*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
AS-BUILT DESIGN SPECIFICATION FOR UNIV4VEC
Mary Ann Tompkins and Carol A. Sivillo, Principal Investigators Jun. 1981 32 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E82-10085; NASA-CR-161060; JSC-17389;
NAS 1.26:161060; SR-L1-00301; LEMSCO-16676) Avail: NTIS HC A03/MF A01 CSCL 02C

The UNIV4VEC program which is part of the CLSFYG package is described. This program reads a CLASFYG vector parameter file and converts it to a four channel universal formatted file. A.R.H.

N82-21638*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
AS-BUILT DOCUMENTATION OF PROGRAMS TO IMPLEMENT THE ROBERTSON AND DORAISWAMY/THOMPSON MODELS
D. J. Valenziano, Principal Investigator Jun. 1981 96 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E82-10086; NASA-CR-161061; JSC-17400;
NAS 1.26:161061; SR-L1-00717; LEMSCO-16376) Avail: NTIS HC A05/MF A01 CSCL 02C

The software which implements two spring wheat phenology models is described. The main program routines for the Doraiswamy/Thompson crop phenology model and the basic

Robertson crop phenology model are DTMAIN and BRMAIN. These routines read meteorological data files and coefficient files, accept the planting date information and other information from the user, and initiate processing. Daily processing for the basic Robertson program consists only of calculation of the basic Robertson increment of crop development. Additional processing in the Doraiswamy/Thompson program includes the calculation of a moisture stress index and correction of the basic increment of development. Output for both consists of listings of the daily results. T.M.

N82-21639*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

AGRISTARS: FOREIGN COMMODITY PRODUCTION FORECASTING. PROJECT TEST REPORTS DOCUMENT, VOLUME 1

J. T. Waggoner and D. E. Phinney, Principal Investigators Jun. 1981 56 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15800; Proj. AgRISTARS)

(E82-10087; NASA-CR-161063; NAS 1.26:161063; FC-L1-00718-Vol-1; JSC-17155-Vol-1; LEMSCO-16851-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 02C

Foreign Commodity Production Forecasting testing activities through June 1981 are documented. A log of test reports is presented. Standard documentation sets are included for each test. The documentation elements presented in each set are summarized. J.D.H.

N82-21640*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

US CORN AND SOYBEANS EXPLORATORY EXPERIMENT

J. G. Carnes, Principal Investigator Jun. 1981 29 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15800; Proj. AgRISTARS)

(E82-10088; NASA-CR-161057; NAS 1.26:161057; FC-L1-04073; JSC-17129; LEMSCO-16315) Avail: NTIS HC A03/MF A01 CSCL 02C

The results from the U.S. corn/soybeans exploratory experiment which was completed during FY 1980 are summarized. The experiment consisted of two parts: the classification procedures verification test and the simulated aggregation test. Evaluations of labeling, proportion estimation, and aggregation procedures are presented. J.D.H.

N82-21641*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

AS-BUILT DESIGN SPECIFICATION FOR PARHIS

Mary Ann Tompkins, Principal Investigator Jun. 1981 122 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15800; Proj. AgRISTARS)

(E82-10089; NASA-CR-161064; NAS 1.26:161064; SR-L1-00305; JSC-17371; LEMSCO-16650) Avail: NTIS HC A06/MF A01 CSCL 02C

The program is part of the CLASFYG package. It produces histograms of the greenness profile derived parameters alpha, beta, t sub o, and chi squared, which are computed by the CLASFYG program. Alpha is the approximate greenness rise time, beta is the approximate greennss decay time, t sub o is the spectral crop emergence date, and chi squared per degree of freedom is the goodness of fit of the actual data to the computed greenness profile. The program also produces statistical information concerning the parameters. T.M.

N82-21642*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

AS-BUILT DESIGN SPECIFICATION FOR PARCLS

Mary Ann Tompkins, Principal Investigator Jun. 1981 113 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15800; Proj. AgRISTARS)

(E82-10090; NASA-CR-161065; NAS 1.26:161065; SR-L1-00302; JSC-17390; LEMSCO-16677) Avail: NTIS HC A06/MF A01 CSCL 02C

The PARCLS program, part of the CLASFYG package, reads a parameter file created by the CLASFYG program and a pure pixel ground truth file in order to create to classification file of three separate crop categories in universal format. A.R.H.

N82-21643*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

AS-BUILT DESIGN SPECIFICATION FOR MISMAP

P. M. Brown, D. E. Cheng, and M. A. Tompkins, Principal Investigators Jun. 1981 71 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15800; Proj. AgRISTARS)

(E82-10091; NASA-CR-161066; NAS 1.26:161066; SR-L1-00307; JSC-17231; LEMSCO-16300) Avail: NTIS HC A04/MF A01 CSCL 02C

The MISMAP program, which is part of the CLASFYT package, is described. The program is designed to compare classification values with ground truth values for a segment and produce a comparison map and summary table. A.R.H.

N82-21644*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

AS-BUILT DESIGN SPECIFICATION FOR THE CLASFYG PROGRAM

C. L. Horton, Principal Investigator Jun. 1981 129 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15800; Proj. AgRISTARS)

(E82-10092; NASA-CR-161067; NAS 1.26:161067; SR-L1-00304; JSC-17369; LEMSCO-16649) Avail: NTIS HC A07/MF A01 CSCL 02C

This program produces a file with a Universal-formatted header and data records in a nonstandard format. Trajectory coefficients are calculated from 5 to 8 acquisitions of radiance values in the training field corresponding to an agricultural product. These coefficients are then used to calculate a time of emergence and corresponding trajectory coefficients for each pixel in the test field. The time of emergence, two of the coefficients, and the sigma value for each pixel are written to the file. Author

N82-21645*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

PROJECT COMMUNICATIONS/DOCUMENTATION STANDARDS MANUAL

J. T. Waggoner, Principal Investigators and D. E. Phinney Jun. 1981 32 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15800; Proj. AgRISTARS)

(E82-10093; NASA-CR-161055; NAS 1.26:161055; FC-L1-00714; JSC-17141; LEMSCO-16850) Avail: NTIS HC A03/MF A01 CSCL 02C

The standards apply to the identification and description of remote sensing technical crop estimation analysis procedures. Standard working terminology for technical project and programmatic communications among and between FCPF project technologists and managers as well as with other AgRISTARS projects and program management is established. Basic reference material for FCPF project technologists is provided. The material presented can be used as introductory training material for new technical personnel. T.M.

N82-21646*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

AS-BUILT DESIGN SPECIFICATION FOR SEGMENT MAP (SGMAP) PROGRAM

Mary Ann Tompkins, Principal Investigator Jun. 1981 100 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15800; Proj. AgRISTARS)

(E82-10094; NASA-CR-161056; NAS 1.26:161056; SR-LI-00306; JSC-17037; LEMSCO-15937) Avail: NTIS HC A05/MF A01 CSCL 02C

The segment map program (SGMAP), which is part of the CLASFYT package, is described in detail. This program is designed to output symbolic maps or numerical dumps from LANDSAT cluster/classification files or aircraft ground truth/processed ground truth files which are in 'universal' format. M.G.

N82-21647*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

SOYBEAN CANOPY REFLECTANCE AS INFLUENCED BY CULTURAL PRACTICES

M. E. Bauer, Principal Investigator, J. C. Kollenkark, and C. S. T. Daughtry Mar. 1981 46 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15466; Proj. AgRISTARS)

(E82-10105; NASA-CR-167456; NAS 1.26:167456; SR-P1-04038; LARS-021781) Avail: NTIS HC A03/MF A01 CSCL 02C

Experiments were conducted at West Lafayette, Indiana in 1978 and 1979 to study the reflectance factor of soybean canopies as affected by differences in row width, population, planting date, cultivar and soil type. Reflectance factor data were acquired throughout the growing season with a LANDSAT-band radiometer. Agronomic data included plant height, leaf area index, development stage, total fresh and dry biomass, percent soil cover, and grain yield. The results indicate that row width, planting date, and cultivar influence the percent soil cover, leaf area index, and biomass present, which are in turn related to the multispectral reflectance. Additionally, the reflectance data were quite sensitive to the onset of senescence. Soil color and moisture were found to be important factors influencing the reflectance in single LANDSAT bands, but the near infrared/red reflectance ratio and the greeness transformation were less sensitive than the single bands to the soil background present. Author

N82-21648*# Nebraska Univ., Lincoln. Dept. of Biology.

A GRADIENT MODEL OF VEGETATION AND CLIMATE UTILIZING NOAA SATELLITE IMAGERY. PHASE 1: TEXAS TRANSECT

David Greegor and Jim Norwine, Principal Investigators (Texas A & M Univ.) Aug. 1981 65 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Proj. AgRISTARS)

(E82-10107; NASA-CR-167454; NAS 1.26:167454; FC-J1-04176; JSC-17435) Avail: NTIS HC A04/MF A01 CSCL 02C

A climatological model/variable termed the sponge (a measure of moisture availability based on daily temperature maxima and minima, and precipitation) was tested for potential biogeograhic, ecological, and agro-climatological applications. Results, depicted in tabular and graphic form, suggest that, as generalized climatic index, sponge is particularly appropriate for large-area and global vegetation monitoring. The feasibility of utilizing NOAA/AVHRR data for vegetation classification was investigated and a vegetation gradient model that utilizes sponge and AVHRR data was initiated. Along an east-west Texas gradient, vegetation, sponge, and AVHRR pixel data (channels 1 and 2) were obtained for 12 locations. The normalized difference values for the AVHRR data when plotted against vegetation characteristics (biomass, net productivity, leaf area) and sponge values along the Texas gradient suggest that a multivariate gradient model incorporating AVHRR and sponge data may indeed be useful in global vegetation stratification and monitoring. A.R.H.

N82-21649*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

SAN JUAN NATIONAL FOREST LAND MANAGEMENT PLANNING SUPPORT SYSTEM (LMPSS) REQUIREMENTS DEFINITION Final Report

Lee F. Werth, Principal Investigator Sep. 1981 41 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15800; Proj. AgRISTARS)

(E82-10108; NASA-CR-167448; NAS 1.26:167448; RR-L1-04146; JSC-17422; LEMSCO-17163) Avail: NTIS HC A03/MF A01 CSCL 02F

The role of remote sensing data as it relates to a three-component land management planning system (geographic information, data base management, and planning model) can be understood only when user requirements are known. Personnel at the San Juan National Forest in southwestern Colorado were interviewed to determine data needs for managing and monitoring timber, rangelands, wildlife, fisheries, soils, water, geology and recreation facilities. While all the information required for land management planning cannot be obtained using remote sensing techniques, valuable information can be provided for the geographic information system. A wide range of sensors such as small and large format cameras, synthetic aperture radar, and LANDSAT data should be utilized. Because of the detail and accuracy required, high altitude color infrared photography should serve as the baseline data base and be supplemented and updated with data from the other sensors. A.R.H.

N82-21650*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

AN EVALUATION OF ISOCLS AND CLASSY CLUSTERING ALGORITHMS FOR FOREST CLASSIFICATION IN NORTHERN IDAHO

Lee F. Werth, Principal Investigator Sep. 1981 21 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15800; Proj. AgRISTARS)

(E82-10109; NASA-CR-167447; NAS 1.26:167447; RRI-L1-04143; JSC-17418; LEMSCO-17154) Avail: NTIS HC A02/MF A01 CSCL 02F

Both the iterative self-organizing clustering system (ISOCLS) and the CLASSY algorithms were applied to forest and nonforest classes for one 1:24,000 quadrangle map of northern Idaho and the classification and mapping accuracies were evaluated with 1:30,000 color infrared aerial photography. Confusion matrices for the two clustering algorithms were generated and studied to determine which is most applicable to forest and rangeland inventories in future projects. In an unsupervised mode, ISOCLS requires many trial-and-error runs to find the proper parameters to separate desired information classes. CLASSY tells more in a single run concerning the classes that can be separated, shows more promise for forest stratification than ISOCLS, and shows more promise for consistency. One major drawback to CLASSY is that important forest and range classes that are smaller than a minimum cluster size will be combined with other classes. The algorithm requires so much computer storage that only data sets as small as a quadrangle can be used at one time. A.R.H.

N82-21651*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

TRANSITION YEAR LABELING ERROR CHARACTERIZATION STUDY Final Report

N. James Clinton, Principal Investigators Oct. 1980 81 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15800; Proj. AgRISTARS)

(E82-10111; NASA-CR-160887; NAS 1.26:160887; RC-LO-00479; LEMSCO-14056) Avail: NTIS HC A05/MF A01 CSCL 05B

Labeling errors made in the large area crop inventory experiment transition year estimates by Earth Observation Division image analysts are identified and quantified. The analysis was made from a subset of blind sites in six U.S. Great Plains states (Oklahoma, Kansas, Montana, Minnesota, North and South Dakota). The image interpretation basically was well done, resulting in a total omission error rate of 24 percent and a comission error rate of 4 percent. The largest amount of error was caused by factors beyond the control of the analysts who were following the interpretation procedures. The odd signatures, the largest error cause group, occurred mostly in areas of moisture abnormality. Multicrop labeling was tabulated showing the distribution of labeling for all crops. Author

N82-21652*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

WHEAT STRESS INDICATOR MODEL, EARLY WARNING (EW) DATA BASE INTERFACE DRIVER, USER'S MANUAL

R. F. Hansen, Principal Investigator Nov. 1981 15 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15800; Proj. AgRISTARS)

(E82-10115; NASA-CR-167480; NAS 1.26:167480; EW-L1-00732; JSC-17793; LEMSCO-17179) Avail: HC A02/MF A01 CSCL 02C

Detailed instructions on the use of the wheat stress indicator model, early warning (EW) data base interface driver are given. The purpose of this system is to interface the wheat stress indicator model with the EW operational data base. The interface driver routine decides what meteorological stations data should be processed and calls the proper subroutines to process the stations data. M.G.

N82-21653*# Department of Agriculture, Washington, D.C.
AGRISTARS: AGRICULTURE AND RESOURCES INVENTORY SURVEYS THROUGH AEROSPACE REMOTE SENSING. ENUMERATOR'S MANUAL, 1981 GROUND DATA SURVEY
Jan. 1981 88 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E82-10116; NASA-CR-167434; NAS 1.26:167434; FC-J1-04108; JSC-16860) Avail: NTIS HC A05/MF A01 CSCL 05B

General information and administrative instructions are provided for individuals gathering ground truth data to support research and development techniques for estimating crop acreage and production by remote sensing by satellite. Procedures are given for personal safety with regards to organophosphorus insecticides, for conducting interviews for periodic observations, for coding the crops identified and their growth stages, and for selecting sites for placing rain gages. Forms are included for those citizens agreeing to monitor the gages and record the rainfall. Segment selection is also considered. A.R.H.

N82-21654*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
DEVELOPMENT OF ROTATION SAMPLE DESIGNS FOR THE ESTIMATION OF CROP ACREAGES
T. G. Lycthuan-Lee, Principal Investigator Sep. 1981 126 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS (Contract NAS9-15800; Proj. AgRISTARS)
(E82-10117; NASA-CR-167438; NAS 1.26:167438; FC-LI-04153; JSC-17427; LEMSCO-15409) Avail: NTIS HC A07/MF A01 CSCL 02C

The idea behind the use of rotation sample designs is that the variation of the crop acreage of a particular sample unit from year to year is usually less than the variation of crop acreage between units within a particular year. The estimation theory is based on an additive mixed analysis of variance model with years as fixed effects, (a sub t), and sample units as a variable factor. The rotation patterns are decided upon according to: (1) the number of sample units in the design each year; (2) the number of units retained in the following years; and (3) the number of years to complete the rotation pattern. Different analytic formulae for the variance of (a sub t) and the variance comparisons in using a complete survey of the rotation patterns. A.R.H.

N82-21655*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
SAMPLE SELECTION IN FOREIGN SIMILARITY REGIONS FOR MULTICROP EXPERIMENTS
J. T. Malin, Principal Investigator Aug. 1981 44 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E82-10118; NASA-CR-167439; NAS 1.26:167439; FC-L1-04120; JSC-17401; LEMSCO-16663) Avail: NTIS HC A03/MF A01 CSCL 02C

The selection of sample segments in the U.S. foreign similarity regions for development of proportion estimation procedures and error modeling for Argentina, Australia, Brazil, and USSR in AgRISTARS is described. Each sample was chosen to be similar in crop mix to the corresponding indicator region sample. Data sets, methods of selection, and resulting samples are discussed. A.R.H.

N82-21656*# Research and Data Systems, Inc., Lanham, Md.
DEVELOPMENT OF A SURFACE ISOLATION ESTIMATION TECHNIQUE SUITABLE FOR APPLICATION OF POLAR ORBITING SATELLITE DATA
P. A. Davis and L. M. Penn, Principal Investigators Nov. 1981 77 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS (NASA Order C-00741; Proj. AgRISTARS)
(E82-10122; NASA-CR-167473; NAS 1.26:167473; YM-N1-04198; JSC-17784) Avail: NTIS HC A05/MF A01 CSCL 04A

A technique is developed for the estimation of total daily insolation on the basis of data derivable from operational polar-orbiting satellites. Although surface insolation and meteorological observations are used in the development, the algorithm is constrained in application by the infrequent daytime polar-orbiter coverage. Author

N82-21657*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
A LOOK AT THE COMMONLY USED LANDSAT VEGETATION INDICES
G. E. Miller, Principal Investigator Oct. 1981 37 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E82-10123; NASA-CR-167474; NAS 1.26:167474; EW-L1-04134; JSC-17413; LEMSCO-16844) Avail: NTIS HC A03/MF A01 CSCL 02C

The origins, development, and logic of the indices are discussed. The relationships of the indices to ground-based measurements of vegetation are highlighted. An effort was made to preserve the order in which the various indices appeared in the literature in order to historically trace their underlying concepts. T.M.

N82-21658*# Environmental Research Inst. of Michigan, Ann Arbor.
THE 1981 ARGENTINA GROUND DATA COLLECTION
Robert Horvath, Robert N. Colwell, Principal Investigators, David Hicks, Buzz Sellman, Edwin Sheffner, Gene Thomas, and Byron Wood Oct. 1981 100 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Prepared in cooperation with California Univ., Berkeley Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS
(Contracts NAS9-15476; NAS9-14565; Proj. AgRISTARS)
(E82-10127; NASA-CR-167451; NAS 1.26:167451; SR-E1-04174; ERIM-152400-12-T) Avail: NTIS HC A05/MF A01 CSCL 05B

Over 600 fields in the corn, soybean and wheat growing regions of the Argentine pampa were categorized by crop or cover type and ancillary data including crop calendars, historical crop production statistics and certain cropping practices were also gathered. A summary of the field work undertaken is included along with a country overview, a chronology of field trip planning and field work events, and the field work inventory of selected sample segments. LANDSAT images were annotated and used as the field work base and several hundred ground and aerial photographs were taken. These items along with segment descriptions are presented. Meetings were held with officials of the State Secretariat of Agriculture (SEAG) and the National Commission on Space Investigations (CNIE), and their support to the program are described. A.R.H.

N82-21659*# Paris VI Univ. (France).
PRELIMINARY MODELS OF THE CORE FIELD Progress Report
Jean-Louis LeMouel, Principal Investigator, Armand Galdeano, and Joel Ducruix 1 Aug. 1981 5 p Sponsored by NASA ERTS
(E82-10129; NASA-CR-168513; NAS 1.26:168513) Avail: NTIS HC A02/MF A01 CSCL 05B

Using the CHROFIN tapes containing MAGSAT data for the month of December, two spherical harmonic models were

prepared. One of these models was specially designed to study the Bangui anomaly region. For this region an attempt was made to downward continue the data and to compare it with the existing ground level map. M.G.

N82-21660*# Washington Univ., St. Louis, Mo. Center for Development Technology.
PROGRAM ON STIMULATING OPERATIONAL PRIVATE SECTOR USE OF EARTH OBSERVATION SATELLITE INFORMATION Final Report, 1 Nov. 1979 - 15 Jan. 1981
Lester F. Eastwood, Jr., Jerry Foshage, Guillermo Gomez, Becky Kirkpatrick, Barry Konig, and Robert Stein, Principal Investigators 15 Jan. 1981 216 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS
(Contract NASw-3331)
(E82-10131; NASA-CR-168515; NAS 1.26:168515) Avail: NTIS HC A10/MF A01 CSCL 05B

Ideas for new businesses specializing in using remote sensing and computerized spatial data systems were developd. Each such business serves as an 'information middleman', buying raw satellite or aircraft imagery, processing these data, combining them in a computer system with customer-specific information, and marketing the resulting information products. Examples of the businesses the project designed are: (1) an agricultural facility site evaluation firm; (2) a mass media grocery price and supply analyst and forecaster; (3) a management service for privately held woodlots; (4) a brokerage for insulation and roofing contractors, based on infrared imagery; (5) an expanded real estate information service. In addition, more than twenty-five other commercially attractive ideas in agribusiness, forestry, mining, real estate, urban planning and redevelopment, and consumer information were created. The commercial feasibility of the five business was assessed. This assessment included market surveys, revenue projections, cost analyses, and profitability studies. The results show that there are large and enthusiastic markets willing to pay for the services these businesses offer, and that the businesses could operate profitably. M.G.

N82-21661*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
SONORA EXPLORATORY STUDY FOR THE DETECTION OF WHEAT-LEAF RUST
R. W. Payne, Principal Investigator Nov. 1980 43 p refs ERTS
(Contract NAS9-15800)
(E82-10133; NASA-CR-161051; JSC-16956; NAS 1.26:161051; LEMSCO-15604) Avail: NTIS HC A03/MF A01 CSCL 02C

The applicability of LANDSAT remote sensing technology to the detection of a wheat-leaf-rust epidemic in Sonora, Mexico, during 1977 was investigated. LANDSAT data acquired during crop years 1975-76 and 1976-77 were clustered, classified, and analyzed in order to detect agricultural changes. Analysis of 1977 data indicates a significant proportion of the identified wheat is stressed (potentially rust-infected). Additional analyses show a significant increase in fallowing during the year, as well as a substantial decrease in reservoir levels in the Sonora agricultural region. Ground observations are required to substantiate these analyses. The possibility exists that heat-rust is not LANDSAT detectable and that the clusters identified as containing stressed signatures represent different varieties of wheat or perhaps nonwheat crops. A.R.H.

N82-21662*# Stanford Univ., Calif. Dept. of Geology.
HCMM: SOIL MOISTURE IN RELATION TO GEOLOGIC STRUCTURE AND LITHOLOGY, NORTHERN CALIFORNIA Final Report
Ernest I. Rich, Principal Investigator May 1981 26 p Original contains imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20771. Domestic users send orders to 'Attn: National Space Science Data Center'; non-domestic users send orders to 'Attn: World Data Center A for Rockets and Satellites'. HCMM
(Contract NAS5-24479)
(E82-10135; NASA-CR-168518; NAS 1.26:168518) Avail: NTIS HC A03/MF A01 CSCL 08G

Heat capacity mapping mission images of about 80,000 sq km in northern California were qualitatively evaluated for usefulness in regional geologic investigations of structure and lithology. The thermal characteristics recorded vary among the several geomorphic provinces and depend chiefly on the topographic expression and vegetation cover. Identification of rock types, or groups of rock types, was most successfully carried out within the semiarid parts of the region; however, extensive features, such as faults, folds and volcanic fields could be delineated. Comparisons of seasonally obtained HCMM images are of limited value except in semiarid regions. Author

N82-21663*# North Carolina State Univ., Raleigh. Dept. of Marine, Earth and Atmospheric Sciences.
COMPATIBILITY STUDY OF THE MAGSAT DATA AND AEROMAGNETIC DATA Progress Report
I. J. Won, Principal Investigator Aug. 1981 15 p refs
(Contract NAS5-26157)
(E82-10136; NASA-CR-168521; NAS 1.26:168521) Avail: NTIS HC A02/MF A01 CSCL 05B

The results of (1) an analysis of the fine attitude MAGSAT data covering the continental U.S., (2) analysis of the Project MAGNET U.S. aeromagnetic data in terms of its compatibility with the corresponding MAGSAT data, and finally, (3) analysis of MAGSAT data in the Pacific region and comparison with satellite gravity data are presented. All data reduction procedures are described and the resulting magnetic maps are given. The results indicate a general compatibility between the MAGSAT data and the MAGNET and gravity data. M.G.

N82-21664*# Geological Survey, Denver, Colo. Petrophysics and Remote Sensing.
APPLICATION OF HCMM DATA TO REGIONAL GEOLOGIC ANALYSIS FOR MINERAL AND ENERGY RESOURCE EVALUATION Progress Report, Jun. - Aug. 1981
Kenneth Watson, Principal Investigator and Susanne H-Miller Aug. 1981 4 p Sponsored by NASA HCMM
(E82-10137; NASA-CR-168522; NAS 1.26:168522) Avail: NTIS HC A02/MF A01 CSCL 08G

Experimentation with several potentially promising techniques led to the selection of a fairly simple scheme for registration of data from the HCMM using an affine transformation. A method based solely on remote sensing was developed to estimate those meteorological effects which are required for thermal inertia mapping. It assumes that the atmospheric fluxes are spatially invariant and that the solar, sky and sensible heat fluxes can be approximated by a simple mathematical form. Coefficients are determined from least squares method by fitting observational data to the thermal model.

N82-21665*# Paris VI Univ. (France).
CONTINUATION OF POTENTIAL FIELD DATA TO A COMMON ALTITUDE
Jean-Louis LeMouel, Principal Investigator and Joel Ducruix 1 Apr. 1981 3 p refs Sponsored by NASA ERTS
(E82-10138; NASA-CR-168523; NAS 1.26:168523) Avail: NTIS HC A02/MF A01 CSCL 05B

It is noted that the distorsions introduced by the variation of distance between the sources and the measurement points can be important enough to create fake anomalies. The average amplitude of the anomalies at MAGSAT altitude is of the order of a few nT. Thus it is necessary to be careful in reducing MAGSAT data to a common elevation. The achievement of the corresponding anomaly map is of primary importance for the study of regional and long wave length anomalies. A method for the continuation of potential fields is described which consists in representing any harmonic function (in particular the anomaly is function of space coordinates) as a sum of elementary harmonic functions; the continuation being achieved by an inverse technique. Tests, made on a synthetic set of data, evaluate the method. M.G.

N82-21666*# Paris VI Univ. (France).
SEPARATION OF INTERNAL AND EXTERNAL FIELDS: A NEW TECHNIQUE OF DATA SCREENING Progress Report
Jean-Louis LeMouel, Principal Investigator, Michel Menvielle, and Joel Ducruix 1 Dec. 1980 5 p ref Sponsored by NASA ERTS

(E82-10139; NASA-CR-168524; NAS 1.26:168524) Avail: NTIS HC A02/MF A01 CSCL 05B

A method for eliminating transient variation from MAGSAT data is described. Instead of using the conventional Kp index, the Km index is used for the rejection of nonquiet data. To build the Km index, the surface of the Earth is divided in eight sectors. Each sector is defined by two or three magnetic observatories and its geographic limits. For each three hourly interval the MAGSAT tracks were drawn on a map showing the location of the station (the crosses), the limits of the sector, and the value of the mean K index inside each sector. No figure in a sector means that the activity level in this sector is lower than 5 nt; in a sector covered with number 1, the activity lies between 5 and 20 nt; 2 stands for any level greater than 20 nT. M.G.

N82-21667*# Research Triangle Inst., Research Triangle Park, N. C.

A STUDY OF MODEL PARAMETERS ASSOCIATED WITH THE URBAN CLIMATE USING HCMM DATA Quarterly Progress Report

Nov. 1981 5 p HCMM

(Contract NAS5-26442)

(E82-10140; NASA-CR-168525; NAS 1.26:168525) Avail: NTIS HC A02/MF A01 CSCL 13B

The use of infrared and visible data from the Heat Capacity Mapping Mission (HCMM) and in situ data to study the intensity of the urban heat island of Saint Louis is described. Analysis of HCMM data shows that an urban heat island exists day and night in all seasons when clear skies prevail. The lower albedo value of the urban region during the day suggests that the higher temperatures are due to more absorption of solar radiation. Preliminary analysis of in situ meteorological data was performed after merging with HCMM data, and surface roughness, the exchange coefficient, and the soil moisture were calculated. J.D.

N82-21668*# Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.

DELINEATION OF SOIL TEMPERATURE REGIMES FROM HCMM DATA Quarterly Report

Rick L. Day and Gary W. Petersen, Principal Investigators 31 Dec. 1981 3 p HCMM

(E82-10141; NASA-CR-168526; NAS 1.26:168526) Avail: NTIS HC A02/MF A01 CSCL 08M

Evaluation of LANDSAT and Heat Capacity Mapping Mission (HCMM) data as input into National Cooperative Soil Survey is discussed. Signature classification techniques were applied to 13 May 76 LANDSAT data. LANDSAT data was overlaid with HCMM data, revealing registration problems caused by a shortage of control points in LANDSAT data, and the WARP program developed to improve registration accuracy. Initial images for control point selection were produced using digital terrain elevation data. Statistical procedures for evaluating data classification and to describe spatial distribution of surface temperature and its correlation with soil surface conditions were investigated. J.D.

N82-21669*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

A MULTIBAND RADIOMETER AND DATA ACQUISITION SYSTEM FOR REMOTE SENSING FIELD RESEARCH

M. E. Bauer, Principal Investigator, B. F. Robinson, D. P. DeWitt, L. F. Silva, and V. C. Vanderbilt Nov. 1981 14 p refs Repr. from from Proc. of the Intern. Arch. of Photogrammetry (West Germany), v. 23(B8) p 783-793 Presented at the 14th Congr. of the Intern. Soc. for Photogrammetry, Hamburg, 13-25 Jul. 1980 Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15466; Proj. AgRISTARS)

(E82-10142; NASA-CR-167506; NAS 1.26:167506; SR-P1-04201; LARS-071480) Avail: NTIS HC A02/MF A01 CSCL 14B

Specifications are described for a recently developed prototype multispectral data acquisition system which consists of multiband radiometer with 8 bands between 0.4 and 12.5 micrometers and a data recording module to record data from the radometer and ancillary sources. The systems is adaptable to helicopter, truck, or tripod platforms, as well as hand-held operation. The general characteristics are: (1) comparatively inexpensive to acquire, maintain and operate; (2) simple to operate and calibrate; (3) complete with data hardware and software; and (4) well documented for use by researchers. The instrument system is to be commercially available and can be utilized by many researchers to obtain large numbers of accurate, calibrated spectral measurements. It can be a key element in improving and advancing the capability for field research in remote sensing. A.R.H.

N82-21670*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

SPECTRAL-AGRONOMIC RELATIONSHIPS OF CORN, SOYBEAN AND WHEAT CANOPIES

M. E. Bauer, Principal Investigator, C. S. T. Daughtry, and V. C. Vanderbilt Oct. 1981 19 p refs Presented at the Intern. Colloq. on Signatures of Remotely Sensed Objects, Avignon, France, 8-11 Sep. 1981 Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15466; Proj. AgRISTARS)

(E82-10143; NASA-CR-167510; NAS 1.26:167510; SR-PI-04187; LARS-091281) Avail: NTIS HC A02/MF A01 CSCL 20F

During the past six years several thousand reflectance spectra of corn, soybean, and wheat canopies were acquired and analyzed. The relationships of biophysical variables, including leaf area index, percent soil cover, chlorophyll and water content, to the visible and infrared reflectance of canopies are described. The effects on reflectance of cultural, environmental, and stress factors such as planting data, seeding rate, row spacing, cultivar, soil type and nitrogen fertilization are also examined. The conclusions are that several key agronomic variables including leaf area index, development stage and degree of stress are strongly related to spectral reflectance and that it should be possible to estimate these descriptions of crop condition from satellite acquired multispectral data. A.R.H.

N82-21671*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

SIMULATED RESPONSE OF A MULTISPECTRAL SCANNER OVER WHEAT AS A FUNCTION OF WAVELENGTH AND VIEW/ILLUMINATION DIRECTION

M. E. Bauer, Principal Investigator, V. C. Vanderbilt, B. F. Robinson, L. L. Biehl, and A. S. Vanderbilt Nov. 1981 14 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15466; Proj. AgRISTARS)

(E82-10144; NASA-CR-167505; NAS 1.26:167505; SR-P1-04202; LARS-071580) Avail: NTIS HC A02/MF A01 CSCL 02C

The reflectance response with view angle of wheat, was analyzed. The analyses, which assumes there are no atmospheric effects, and otherwise simulates the response of a multispectral scanner, is based upon spectra taken continuously in wavelength from 0.45 to 2.4 micrometers at more than 1200 view/illumination directions using an Exotech model 20C spectra radiometer. Data were acquired six meters above four wheat canopies, each at a different growth stage. The analysis shows that the canopy reflective response is a pronounced function of illumination angle, scanner view angle and wavelength. The variation is greater at low solar elevations compared to high solar elevations. A.R.H.

N82-21672*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

VARIABILITY OF REFLECTANCE MEASUREMENTS WITH SENSOR ALTITUDE AND CANOPY TYPE

C. S. T. Daughtry, V. C. Vanderbilt, and V. J. Pollara Nov. 1981 24 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15466; Proj. AgRISTARS)

(E82-10145; NASA-CR-167509; NAS 1.26:167509; SR-P1-04191; LARS-111481) Avail: NTIS HC A02/MF A01 CSCL 20F

Data were acquired on canopies of mature corn planted in

76 cm rows, mature soybeans planted in 96 cm rows with 71 percent soil cover, and mature soybeans planed in 76 cm rows with 100 percent soil cover. A LANDSAT band radiometer with a 15 degree field of view was used at ten altitudes ranging from 0.2 m to 10 m above the canopy. At each altitude, measurements were taken at 15 cm intervals also a 2.0 m transect perpendicular to the crop row direction. Reflectance data were plotted as a function of altitude and horizontal position to verify that the variance of measurements at low altitudes was attributable to row effects which disappear at higher altitudes where the sensor integrate across several rows. The coefficient of variation of reflectance decreased exponentially as the sensor was elevated. Systematic sampling (at odd multiples of 0.5 times the row spacing interval) required fewer measurements than simple random sampling over row crop canopies. A.R.H.

N82-21673*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

DETERMINATION OF THE OPTIMAL LEVEL FOR COMBINING AREA AND YIELD ESTIMATES

Marvin E. Bauer, Principal Investigator, M. M. Hixson, and C. D. Jobusch 12 Oct. 1981 70 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15466; Proj. AgRISTARS)

(E82-10146; NASA-CR-168531; NAS 1.26:168531; FC-P1-04197; LARS-101281) Avail: NTIS HC A04/MF A01 CSCL 02C

Several levels of obtaining both area and yield estimates of corn and soybeans in Iowa were considered: county, refined strata, refined/split strata, crop reporting district, and state. Using the CCEA model form and smoothed weather data, regression coefficients at each level were derived to compute yield and its variance. Variances were also computed with stratum level. The variance of the yield estimates was largest at the state and smallest at the county level for both crops. The refined strata had somewhat larger variances than those associated with the refined/split strata and CRD. For production estimates, the difference in standard deviations among levels was not large for corn, but for soybeans the standard deviation at the state level was more than 50% greater than for the other levels. The refined strata had the smallest standard deviations. The county level was not considered in evaluation of production estimates due to lack of county area variances. A.R.H.

N82-21674*# Wisconsin Univ., Madison.

INVESTIGATION OF ANTARCTIC CRUST AND UPPER MANTLE USING MAGSAT AND OTHER GEOPHYSICAL DATA Quarterly Status and Technical Progress Report

C. R. Bentley, Principal Investigator 30 Nov. 1981 6 p refs ERTS

(Contract NAS5-25977)

(E82-10147; NASA-CR-168532; NAS 1.26:168532; QTPR-7) Avail: NTIS HC A02/MF A01 CSCL 08G

The isolation of the crustal magnetic anomaly field is discussed. Slowly spatially varying ring current fields were modeled as a least squares fit to each MAGSAT pass over Antarctica. Selection criteria were applied to data from 3000 MAGSAT passes to remove field aligned currents, yielding 87 data sets used to construct a scalar magnetic anomaly map for regions south of 55 S latitude. Internal tests performed on MAGSAT data and omparisons with the POGO map indicated that the general anomaly features are of crustal origin. The sources of anomalies generated in continental and in oceanic regions are discussed. Correlations were found between crustal magnetic anomalies and known geologic features over West and East Antarctica and over the surrounding oceanic regions. J.D.

N82-21675*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

COMPARISON OF STORM-TIME CHANGES OF GEOMAGNETIC FIELD AT GROUND AND AT MAGSAT ALTITUDES Progress Report

Rajaram Purushottam Kane and Nalin Babulal Trivedi Dec. 1981 15 p refs Sponsored by NASA ERTS

(E82-10148; NASA-CR-168533; NAS 1.26:168533) Avail: NTIS HC A02/MF A01 CSCL 08G

Computations concerning variations of the geomagnetic field at MAGSAT altitudes were investigated. Using MAGSAT data for the X, Y, and Z components of the geomagnetic field, a computer conversion to yield the H component was performed. Two methods of determining delta H normalized to a constant geocentric distance R sub 0 = 6800 were investigated, and the utility of elta H at times of magnetic storms was considered. Delta H at a geographical latitude of 0 at dawn and dusk, the standard Dst, and K sub p histograms were plotted and compared. Magnetic anomalies are considered. Examination of data from the majority of the 400 passes of MAGSAT considered show a reasonable delta H versus latitude variation. Discrepancies in values are discussed. J.D.

N82-21676*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

AGRISTARS: SUPPORTING RESEARCH. CLASSIFICATION OF CORN: BADHWAR PROFILE SIMILARITY TECHNIQUE

Willa W. Austin, Principal Investigator Aug. 1981 46 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15800; Proj. AgRISTARS)

(E82-10150; NASA-CR-167409;JSC-17113; NAS 1.26:167409; SR-L1-04049; LEMSCO-16035) Avail: NTIS HC A03/MF A01 CSCL 02C

The same software programs used to classify spring wheat are applied to the classification of corn in 26 segments in the corn belt. Numerical results of the acreage estimation are given. Potential problem areas defined in an earlier application are examined. A.R.H.

N82-21677*# Iowa Univ., Iowa City. Dept. of Geology.

USE OF MAGSAT ANOMALY DATA FOR CRUSTAL STRUCTURE AND MINERAL RESOURCES IN THE US MIDCONTINENT Quarterly Report, period ending 30 Jun. 1981

Robert S. Carmichael, Principal Investigator 30 Jun. 1981 4 p ERTS

(Contract NAS5-26425)

(E82-10152; NASA-CR-168537; NAS 1.26:168537; QR-2) Avail: NTIS HC A02/MF A01 CSCL 08G

While the preliminary magnetic anomaly map for the centra midcontinent is only in the hand-drawn stage, it agrees in broad aspects with the preliminary global MAGSAT map provided by NASA. Because of data evaluation and finer scale averaging, there are more detailed features which hold promise for eventual geological/crustal interpretation. Some current analysis is directed at examining whether a map data feature such as an elongated anomaly or trend, which seems parallel to satellite data tracks, is likely of crustal origin or is an artifact of the data set. A.R.H.

N82-21678*# Agricultural Research Service, Weslaco, Tex.

METHODS OF EDITING CLOUD AND ATMOSPHERIC LAYER AFFECTED PIXELS FROM SATELLITE DATA Quarterly Progress Report, 5 Sep. - 5 Dec. 1981

Paul R. Nixon, Principal Investigator, Craig L. Wiegand, Arthur J. Richardson, and Michael P. Johnson Dec. 1981 6 p ref HCMM

(NASA Order S-75406B)

(E82-10154; NASA-CR-168539; NAS 1.26:168539; PR-4) Avail: NTIS HC A02/MF A01 CSCL 05B

Plotted transects made from south Texas daytime HCMM data show the effect of subvisible cirrus (SCI) clouds in the emissive (IR) band but the effect is unnoticable in the reflective (VIS) band. The depression of satellite indicated temperatures ws greatest in the center of SCi streamers and tapered off at the edges. Pixels of uncontaminated land and water features in the HCMM test area shared identical VIS and IR digital count combinations with other pixels representing similar features. A minimum of 0.015 percent repeats of identical VIS-IR combinations are characteristic of land and water features in a scene of 30 percent cloud cover. This increases to 0.021 percent of more when the scene is clear. Pixels having shared VIS-IR combinations less than these amounts are considered to be cloud contaminated in the cluster screening method. About twenty percent of SCi was machine indistinguishable from land features in two dimensional spectral space (VIS vs IR). T.M.

N82-21679*# Brown Univ., Providence, R. I. Dept. of Geological Sciences.

ELECTROMAGNETIC DEEP-PROBING (100-1000 KMS) OF THE EARTH'S INTERIOR FROM ARTIFICIAL SATELLITES: CONSTRAINTS ON THE REGIONAL EMPLACEMENT OF CRUSTAL RESOURCES Quarterly Progress Report, 30 Sep. - 31 Dec. 1981

John F. Hermance, Principal Investigator 31 Dec. 1981 16 p refs ERTS

(Contract NAS5-26138)

(E82-10155; NASA-CR-168540; NAS 1.26:168540; QPR-6) Avail: NTIS HC A02/MF A01 CSCL 08G

Model simulations show that induction in a spherical Earth by distant magnetospheric sources can contribute magnetic field fluctuations at MAGSAT altitudes which are 30 to 40 percent of the external field amplitudes. When the characteristic dimensions (e.g. depth of penetration, etc) of a particular situations are small compared with the Earth's radius, the Earth can be approximated by a plane horizontal half space. In this case, electromagnetic energy is reflected with close to 100 percent efficiency from the Earth's surface. This implies that the total horizontal field is twice the source field when the source is above the satellite, but is reduced to values which are much smaller than the source field when the source is below the satellite. This latter effect tends to enhance the signature of gross electrical discontinuities in the lithosphere when observed at satellite altitudes. A.R.H.

N82-21680*# Hydex Corp., Fairfax, Va.

STRATEGIES FOR USING REMOTELY SENSED DATA IN HYDROLOGIC MODELS Final Report

E. L. Peck, T. N. Keefer, and E. R. Johnson, Principal Investigators 31 Jul. 1981 85 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS5-26446; Proj. AgRISTARS)

(E82-10156; NASA-CR-166729; NAS 1.26:166729) Avail: NTIS HC A05/MF A01 CSCL 05B

Present and planned remote sensing capabilities were evaluated. The usefulness of six remote sensing capabilities (soil moisture, land cover, impervious area, areal extent of snow cover, areal extent of frozen ground, and water equivalent of the snow cover) with seven hydrologic models (API, CREAMS, NWSRFS, STORM, STANFORD, SSARR, and NWSRFS Snowmelt) were reviewed. The results indicate remote sensing information has only limited value for use with the hydrologic models in their present form. With minor modifications to the models the usefulness would be enhanced. Specific recommendations are made for incorporating snow covered area measurements in the NWSRFS Snowmelt model. Recommendations are also made for incorporating soil moisture measurements in NWSRFS. Suggestions are made for incorporating snow covered area, soil moisture, and others in STORM and SSARR. General characteristics of a hydrologic model needed to make maximum use of remotely sensed data are discussed. Suggested goals for improvements in remote sensing for use in models are also established. Author

N82-21681*# Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.

USE OF THERMAL INERTIA DETERMINED BY HCMM TO PREDICT NOCTURNAL COLD PRONE AREAS IN FLORIDA Quarterly Report, 16 Jun. - 15 Sep. 1981

L. H. Allen, Jr., Principal Investigator, Ellen Chen, J. D. Martsolf, and P. H. Jones 15 Sep. 1981 23 p ref Original contains imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20771. Domestic users send orders to 'Attn: National Space Science Data Center'; non-domestic users send orders to 'Attn: World Data Center A for Rockets and Satellites'. HCMM

(Contract NAS5-26453)

(E82-10157; NASA-CR-164927; NAS 1.26:164927; QR-2) Avail: NTIS HC A02/MF A01 CSCL 08F

Transparencies, prints, and computer compatible tapes of temperature differential and thermal inertia for the winter of 1978 to 1979 were obtained. Thermal inertial differences in the South Florida depicted include: drained organic soils of the Everglades agricultural area, undrained organic soils of the managed water conservation areas of the South Florida water management district, the urbanized area around Miami, Lake Okeechobee, and the mineral soil west of the Everglades agricultural area. The range of wetlands and uplands conditions within the Suwanee River basin was also identified. It is shown that the combination of wetlands uplands surface features of Florida yield a wide range of surface temperatures related to wetness of the surface features. E.A.K.

N82-21682*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

AGRISTARS: SUPPORTING RESEARCH. US CROP CALENDARS IN SUPPORT OF THE EARLY WARNING PROJECT

T. Hodges, Principal Investigator Jul. 1981 134 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15800; Proj. AgRISTARS)

(E82-10158; NASA-CR-167417;JSC-17402; NAS 1.26:167417; SR-L1-04122; LEMSCO-14674) Avail: NTIS HC A07/MF A01 CSCL 05B

The crop calendars produced for the Large Area Crop Inventory Experiment (LACIE) and crop calendar samples for Colorado, Iowa, Kansas, Minnesota, Montana, Nebraska, North Dakota, South Dakota, and Texas are presented. These calendars are based on weekly crop reporting district level observations of the percentage of various crops at several growth stages. A sample of the statistical treatments of the weekly data is provided. Four to five years of 50-percent dates for stages on a crop reporting district level for Arkansas, Iowa, Kentucky, Louisiana, Michigan, Mississippi, Ohio and Wisconsin are also given. M.G.

N82-21683*# Research Triangle Inst., Research Triangle Park, N. C. Geosciences Dept.

A STUDY OF MODEL PARAMETERS ASSOCIATED WITH THE URBAN CLIMATE USING HCMM DATA Quarterly Progress Report

Jul. 1981 7 p HCMM

(Contract NAS5-26442)

(E82-10159; NASA-CR-168542; NAS 1.26:168542) Avail: NTIS HC A02/MF A01 CSCL 13B

Infrared and visible data from the Heat Capacity Mapping Mission (HCMM) satellite were used to study the intensity of the urban heat island, commonly defined as the temperature difference between the center of the city and the surrounding suburban and rural regions, as a function of changes in the season and changes in meteorological conditions in order to derive various parameters which may be used in numerical models for urban climate. The analysis was focused on the city of St. Louis; and in situ data from St. Louis was combined with HCMM data in order to derive the various parameters. The HCMM data were mapped onto a Mercator projection map of the city and ground temperatures were established using data corrected for the effects of atmospheric absorption. The corrected and uncorrected HCMM data were compared to determine the magnitude of the error induced by atmospheric effects. M.G.

N82-21684*# Research Triangle Inst., Research Triangle Park, N. C. Geosciences Dept.

A STUDY OF MODEL PARAMETERS ASSOCIATED WITH THE URBAN CLIMATE USING HCMM DATA Quarterly Progress Report

Apr. 1981 7 p HCMM

(Contract NAS5-26442)

(E82-10160; NASA-CR-168543; NAS 1.26:168543) Avail: NTIS HC A02/MF A01 CSCL 13B

Progress in the study of the intensity of the urban heat island is reported. The intensity of the heat island is commonly defined as the temperature difference between the center of the city and the surrounding suburban and rural regions. The intensity is considered as a function of changes in the season and changes in meteorological conditions in order to derive various parameters which may be used in numerical models for urban climate. Twelve case studies were selected and CCT's were ordered. In situ data was obtained from sixteen stations scattered about the city of St. Louis. Upper-air meteorological data were obtained and the water vapor and the temperature data were processed. Atmo-

spheric transmissivities were computed for each of the case studies. T.M.

N82-21685*# Pennsylvania State Univ., University Park. Dept. of Meteorology.

APPLICATIONS OF HCMM SATELLITE DATA TO THE STUDY OF URBAN HEATING PATTERNS Final Report, Dec. 1977 - Dec. 1980

Toby N. Carlson, Principal Investigator 1 Dec. 1980 71 p refs Original contains imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20771. Domestic users send orders to 'Attn: National Space Science Data Center'; non-domestic users send orders to 'Attn: World Data Centr A for Rockets and Satellites'. HCMM

(Contract NAS5-24264)

(E82-10161; NASA-CR-168544; NAS 1.26:168544) Avail: NTIS HC A04/MF A01 CSCL 13B

A research summary is presented and is divided into two major areas, one developmental and the other basic science. In the first three sub-categories are discussed: image processing techniques, especially the method whereby surface temperature image are converted to images of surface energy budget, moisture availability and thermal inertia; model development; and model verification. Basic science includes the use of a method to further the understanding of the urban heat island and anthropogenic modification of the surface heating, evaporation over vegetated surfaces, and the effect of surface heat flux on plume spread. T.M.

N82-21686*# Colorado Univ., Boulder. Dept. of Astrogeophysics.

INVESTIGATION OF GEOMAGNETIC FIELD FORECASTING AND FLUID DYNAMICS OF THE CORE Quarterly Status Technical Progress Report, 1 Jul. - 30 Sep. 1981

Edward R. Benton, Principal Investigator 1 Oct. 1981 14 p ERTS

(Contract NAS5-25957)

(E82-10162; NASA-CR-168545; NAS 1.26:168545; QSTPR-7) Avail: NTIS HC A02/MF A01 CSCL 08G

The magnetic determination of the depth of the core-mantle boundary using MAGSAT data is discussed. Refinements to the approach of using the pole-strength of Earth to evaluate the radius of the Earth's core-mantle boundary are reported. The downward extrapolation through the electrically conducting mantle was reviewed. Estimates of an upper bound for the time required for Earth's liquid core to overturn completely are presented. High order analytic approximations to the unsigned magnetic flux crossing the Earth's surface are also presented. T.M.

N82-21687*# National Aeronautics and Space Administration, Washington, D. C.

OBSERVATION OF THE EARTH BY RADAR

Charles Elachi (French Petroleum Inst.) Feb. 1982 33 p Transl. into ENGLISH from La Recherche (France), v. 12, no. 128, Dec. 1981 p 1366-1375 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by French Petroleum Inst.

(Contract NASw-3542)

(NASA-TM-76830; NAS 1.15:76830) Avail: NTIS HC A03/MF A01 CSCL 17I

Techniques and applications of radar observation from Earth satellites are discussed. Images processing and analysis of these images are discussed. Also discussed is radar imaging from aircraft. Uses of this data include ocean wave analysis, surface water evaluation, and topographic analysis. R.J.F.

N82-21688*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

AN INVENTORY OF UNDISCOVERED CANADIAN MINERAL RESOURCES

M. L. Labovitz and J. C. Griffiths Jan. 1982 40 p refs

(NASA-TM-83890; NAS 1.15:83890) Avail: NTIS HC A03/MF A01 CSCL 08G

Unit regional value (URV) and unit regional weight are area standardized measures of the expected value and quantity, respectively, of the mineral resources of a region. Estimation and manipulation of the URV statistic is the basis of an approach to mineral resource evaluation. Estimates of the kind and value of exploitable mineral resources yet to be discovered in the provinces of Canada are used as an illustration of the procedure. The URV statistic is set within a previously developed model wherein geology, as measured by point counting geologic maps, is related to the historical record of mineral resource production of well-developed regions of the world, such as the 50 states of the U.S.A.; these may be considered the training set. The Canadian provinces are related to this training set using geological information obtained in the same way from geologic maps of the provinces. The desired predictions of yet to be discovered mineral resources in the Canadian provinces arise as a consequence. The implicit assumption is that regions of similar geology, if equally well developed, will produce similar weights and values of mineral resources. R.J.F.

N82-21689# Army Engineer Topographic Labs., Fort Belvoir, Va.

A DIGITAL TECHNIQUE FOR CONSTRUCTING VARIABLE-WIDTH LINES

Richard L. Rosenthal Mar. 1982 10 p

(AD-A110287; ETL-R031) Avail: NTIS HC A02/MF A01 CSCL 08/2

This paper describes a digital technique for constructing variable-width cartographic lines. Specifically, an algorithm is developed for generating symbolized lines using multiply-stoked centerline data. Algorithmic development considers three factors: cartographic principles, inherent problems with existing algorithms, and hardware constraints imposed by specific output devices including the Defense Mapping Agency's Laser Platemaker. Software developed from the algorithm uses simple trigonometric functions and may be implemented in applications using vector data with vector or raster plotters. Author (GRA)

N82-21690# Defense Mapping Agency Aerospace Center, St. Louis, Mo.

EXPERIENCES WITH DIGITAL TERRAIN ELEVATION DATA CONTOURING PROGRAMS Interim Report

Philip K. Alderman 26 Jan. 1982 12 p refs

(AD-A110280) Avail: NTIS HC A02/MF A01 CSCL 08/2

The DMA digital terrain elevation data base has been expanding steadily since its inception. With increasing coverage there has been a greater opportunity to apply this data, including the automatic derivation of contours from digital elevation data for aerospace charts. GRA

N82-21691# Naval Surface Weapons Center, Dahlgren, Va.

SOME ALTIMETRIC SIGNATURES FROM SEASAT OVER THE MID-PACIFIC SEAMOUNT RANGE Final Report

Bernd Zondek Oct. 1981 10 p ref

(AD-A110419; NSWC/TR-81-440) Avail: NTIS HC A02/MF A01 CSCL 08/10

Altimetric signatures from SEASAT tracks in the mid-Pacific seamount range reveal that some seamount signatures are not correlated with features in the reference bathymetry. GRA

N82-21692# Defense Mapping Agency Aerospace Center, St. Louis, Mo.

THE DEVELOPMENT OF SMALL SCALE MAP CONTROL VIA DIGITAL PANELING OF LARGE SCALE MAP SOURCE

Charles A. Erpenbach 1982 8 p Presented at the 2nd Tech. Exchange Week, Panama, 25-29 Jan. 1982 and the ACSM-ASP Annual Conv., Denver, 15-19 Mar. 1982

(AD-A110281) Avail: NTIS HC A02/MF A01 CSCL 08/2

A digital method has been devised which circumvents the traditional photomechanical reduction of large scale map source and the subsequent manual paneling of those reductions to a smaller scale control projection. The method requires the automatic digitization (via a scanner) of overlays which depict selected features compiled from the large scale source. The scanned data is vectorized. At a digital edit station, the data are then mathematically transformed to the desired compilation projection using common control points. Through file merging, the data sets are collected and input to a high-speed plotter where planimetric and hypsographic control bases are plotted for chart compilation. Author (GRA)

N82-21693# Equity Oil Co., Salt Lake City, Utah.
BX IN-SITU OIL-SHALE PROJECT Quarterly Technical Progress Report, 1 Jun. - 31 Aug. 1981
Paul M. Dougan 20 Sep. 1981 144 p refs
(Contract DE-FC20-78LC-10747)
(DE82-002134; DOE/LC-10747/T4) Avail: NTIS HC A07/MF A01

The superheated steam injection at the BX In Situ Oil Shale Project is reported. Injection was continuous except for a period when the injection was suspended during the drilling of core hole BX-37. During the quarter, 99,760 barrels of water as superheated steam were injected into project injection wells at an average well head temperature of 7520 F and an average wellhead pressure of 1312 PSIG. During the same period, 135,469 barrels of fluid were produced from the Project production wells for a produced to injected fluid ratio of 1.36 to 1.0. Net oil production during the quarter was 38 barrels. DOE

N82-21694# New Mexico Inst. of Mining and Technology, Socorro. Peteroleum Recovery Research Center.
MEASUREMENT AND CORRELATION OF CONDITIONS FOR ENTRAPMENT AND MOBILIZATION OF RESIDUAL OIL Final Report
N. R. Morrow Sep. 1981 115 p refs
(Contract DE-AS01-78ET-12077)
(DE82-001940; EMD-2-68-3302) Avail: NTIS HC A06/MF A01

Six major tasks are discussed capillary number relationships for rock samples; residual oil saturations near the wellbore; residual oil structure; effect of gravity on residual saturation; magnitude of residual oil saturation; and effects of wettabilityon on capillary number relationships. Detailed progress reports are presented for each task. Measurements of relationships between the ratio of viscous to capillary forces and the reduction in normal waterflood residual oil for a variety of rock types indicate the relative ease with which residual oil can be immiscibly displaced by a tertiary process. In reducing the amount of trapped oil to 50% of normal residual oil saturation, recovery of continuous oil is significantly easier than mobilization of trapped oil. The relative permeabilities of the water phase at reduced residual oil saturations are found to be independent of the displacement mechanism of oil movement by which the reduced residual saturations were achieved. T.M.

N82-21695# Department of Energy, Mines and Resources, Ottawa (Ontario).
DESIGN AND OPERATION OF A MOTORIZED BINARY GAS MIXTURE APPARATUS
S. Silver Feb. 1980 28 p refs
(DE82-900386; ERP/MRL-80-32(TR)) Avail: NTIS HC A03/MF A01

The binary gas mixture apparatus are described. Sequential steps are provided to the user for purging clean the chamber and two methods for preparation of predetermined gas air mixtures. DOE

N82-21696# National Physical Lab., Teddington (England). Acoustics Unit.
AN OBJECTIVE EXPERIMENTAL METHOD FOR STUDYING AVERSION TO NOISE
H. C. Fuller and D. W. Robinson Oct. 1980 24 p refs
(NPL-Ac-98; ISSN-0143-7143) Avail: NTIS HC A02/MF A01

A method which avoids the need to rely on introspection and verbal descriptors in the experimental assessment of reaction to an aversive noise stimulus is presented together with results of an experiment. Subjects were given the option of reducing the impact of an unpleasant auditory stimulus consisting of irregular impulses by substituting a continuous white noise, which at higher levels would itself become aversive. An experiment was conducted with three levels of impulse, and it is found that the method can be used to differentiate successfully between the subjects' reactions to these stimuli. Some subjects show a marked reluctance to experiment with the available level control and there was an indication that the test used to normalize the subjects' attention interfered with the experiment. Author (ESA)

N82-21697# Royal Aircraft Establishment, Farnborough (England).
COMPUTER BASED TECHNIQUE FOR CONVERTING A CONTOUR MAP INTO AN EQUISPACED GRID OF POINTS
P. A. Roberts London HMSO Sep. 1980 68 p
(RAE-TR-80110; RAE-Space-586; BR77598) Avail: NTIS HC A04/MF A01

The purpose of the grid representation is to enable the map data to be handled more easily in a computer. Contours are assumed to represent some physical quantity and thus the variable represented by the contour height is a single valued function of the map coordinates. It is also assumed that the variable is smooth and continuous. The technique has applications in image processing where it may be necessary to compare (by ratioing) an image and a contour map. A grid representation is also an essential prerequisite for degrading the spatial resolution of a contour map by convolution, thus enabling contour maps having different resolutions to be compared at a common resolution. The interpolation algorithms and the reasons for their use are described in detail. Operations are described which may be required to be performed on a grid; those of expanding (or contracting) the number of data points in the grid, and the construction of cross sections. Listings of all programs, written in ANSI FORTRAN V are given. Author (ESA)

N82-21698# Logica Ltd., London (England).
FUTURE EARTHNET DISSEMINATION SYSTEMS (FEDS) STUDY. EXECUTIVE SUMMARY Final Report
M. Macintyre, P. Norris, and P. Scragg Paris ESA Dec. 1980 47 p
(Contract ESA-4241/80/F-FC(SC))
(Rept-3318; ESA-CR(P)-1438) Avail: NTIS HC A03/MF A01

The preparation of Earthnet for the dissemination to users of data from the European remote sensing program is considered. Worldwide plans for remote sensing satellite systems, European and north African user demand, data acquisition subsystems, data processing subsystems, data archiving subsystems and data communications subsystems are covered. Subsystems configurations that would meet these performance requirement are studied. Results are integrated to define overall systems configurations that would meet the performance requirements. Alternate centralized acquires data at four Earth stations and stores it temporarily on magnetic tape. Data are forwarded by satellite and disseminated to users by satellite and terrestrial links. Raw data are stored in a permanent playback archive, on optical disks, at the central site. Author (ESA)

N82-21699# Logica Ltd., London (England).
INTERPRETATION OF REMOTELY SENSED IMAGE DATA AND IMPACT OF CLUSTER COMPRESSION
David J. Stanley Paris ESA Feb. 1981 154 p refs
(Contract ESA-3749/78/NL-HP)
(Rept-44.2866; ESA-CR(P)-1450) Avail: NTIS HC A08/MF A01

Image interpretation techniques are described and related to the needs of application areas. A survey of users and literature shows (1) little correlation between processing techniques and specific applications; (2) most users employ general purpose image analysis algorithms rather than developing special purpose techniques; (3) interpretation methodology frequently involves the use of several preprocessing, enhancement, and classification methods; (4) the majority of operational applications rely on manual photointerpretation; and (5) most digital image interpretation is done with general purpose software packages and/or special hard-wired image analysis systems. Operational users, (a minority), rely heavily on human photointerpretation, especially in geology, and at most use simple linear classifiers or enhancement techniques on interactive image processing systems. The impact of compression is limited because of academic and research user hostility, and decreasing cost of machine processing.
Author (ESA)

N82-21700# European Space Agency, Paris (France).
ATLAS OF METEOSAT IMAGERY
C. A. Brimacombe (ESOC) May 1981 494 p refs In ENGLISH and FRENCH Original contains color illustrations
(ESA-SP-1030; ISSN-0379-6566) Avail: NTIS

HC A21/MF A01; ESA, Paris FF 200 Member States, AU, CN, and NO (+20% others)

A selection of the images received from METEOSAT during its first two years of operation is presented. The METEOSAT system is described and characteristics of images as well as image processing are explained. Imagery is examined as to cloud classification, surface features, and mesoscale cloud formations. Synoptic scale cloud patterns, planetary scale cloud systems, and details of tropical cloud systems are also discussed. Miscellaneous aspects of satellite meteorology are included. Author (ESA)

N82-21701# Water Resources Council, Washington, D.C. Hydrology Committee:

ESTIMATING PEAK FLOW FREQUENCIES FOR NATURAL UNGAGED WATERSHEDS: A PROPOSED NATIONWIDE TEST

1981 364 p refs

(PB81-239329) Avail: NTIS HC A16/MF A01 CSCL 08H

Guidelines for determining flow frequencies at ungaged sites were developed. The results of a pilot test procedure performance are described. The guidelines utilize a classification scheme consisting of eight categories: statistical estimation of peak flows for a given exceedance probability; statistical estimation of moments; index flood; transfer methods, empirical equations; signal storm event; multiple discrete events; and continuous record. T.M.

N82-21702# Geological Survey, Lincoln, Nebr. Water Resources Div.

GEOHYDROLOGIC RECONNAISSANCE OF THE CROFTON UNIT, NORTHEASTERN NEBRASKA Final Report

S. J. Kent, R. A. Engberg, and M. J. Ellis Oct. 1981 40 p refs

(PB82-129115; USGS/WRD/WRI-81-094; USGS/WRI-89-58) Avail: NTIS HC A03/MF A01 CSCL 02C

Sources, location, quantity and quality of ground water in a 350 square mile area whose potential for irrigation development is evaluated are described. The entire area is underlain by precambrian sioux quartzite, which through most of the area is overlain by undifferentiated paleozoic rocks. It is found that the Dakota and Niobrara Formations are each capable of yielding water sufficient for irrigation wells in parts of the area. Pleistocene and holocene deposits yield adequate water for irrigation in the southern part of the area and along the flood plain of the Missouri River. GRA

N82-21703# Tennessee Valley Authority, Chattanooga.

NATIONAL HIGH-ALTITUDE PHOTOGRAPHY (NHAP) OF THE TENNESSEE VALLEY REGION, VOLUME 1, NO. 1

31 Oct. 1981 19 p

(PB82-130899; TVA/ONR/NRO-82/3) Avail: NTIS HC A02/MF A01 CSCL 08B

The capabilities and activities of the photogrammetry and remote sensing section of the mapping services branch are described. The uses of aerial photography are briefly described. Plans for upgrading of services and equipment are discussed. GRA

N82-21704# National Academy of Sciences - National Research Council, Washington, D. C.

REMOTE SENSING FOR WATER RESOURCES AND HYDROLOGY: AN ASSESSMENT OF THE CORPS OF ENGINEERS' PROGRAM Final Report

Nov. 1981 53 p refs

(Contract Dacw72-81-M-0342)

(PB82-137142) Avail: NTIS HC A04/MF A01 CSCL 13B

The U.S. Army Corps of Engineers' program of research and development and technology transfer on the application of remote sensing to problems of water resources and hydrology is reviewed. The Corps' current program consists of work units (coastal engineering, flood prediction and management, hydrology, environmental assessment, and development of techniques and equipment). Current research programs are reviewed and recommendations are made. Author (GRA)

N82-21705# Geological Survey, San Juan (Puerto Rico). Water Resources Div.

WATER RESOURCES DATA FOR PUERTO RICO, WATER YEAR 1978 Water-Data Report, 1 Oct. 1977 - 30 Sep. 1978

1981 820 p refs Prepared in cooperation with the Commonwealth of Puerto Rico

(PB82-134057; USGS/WRD/HD-80/074; USGS/WRD/PR-78-1) Avail: NTIS HC A12/MF A01 CSCL 08H

Water-resources data for surface-water, quality-of-water, and ground-water records for 1978 water year for Puerto Rico consist of records of discharge, water quality of streams, and water levels of wells. This report contains discharge and water-quality records for 34 gaging stations, 71 water-quality stations, and water levels for 46 observation wells. Also included are data for 17 crest-stage partial-record stations. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and the Commonwealth of Puerto Rico. GRA

N82-21706# Bureau of Mines, Twin Cities, Minn. Research Center.

BENEFICIATION OF WESTERN MESABI RANGE OXIDIZED TACONITES: A COMPARISON OF THE ANIONIC AND CATIONIC FLOTATION SYSTEMS AND AN EVALUATION OF POTENTIAL IRON ORE RESERVES Report of Investigations, 1981

Howard D. Jacobs Sep. 1981 29 p refs

(PB82-128851; BM-RI-8552; LC-81-1764) Avail: NTIS CSCL 08I

A bulk sample of oxidized taconite taken from the western Mesabi Range was evaluated by the Bureau of Mines using the Bureau-developed selective flocculation-desliming-cationic (or anionic) flotation process. The raw ore sample containing 32.3 pct Fe was treated by both cationic and anionic flotation. GRA

N82-21707# Bureau of Mines, Pittsburgh, Pa.

GUIDELINES FOR CARRIER PHONE SYSTEMS: INSTALLATION, MAINTENANCE, AND IMPROVEMENT HANDBOOK

James C. Cawley 1981 77 p refs

(PB82-128539; BM-HB-2-81; LC-81-607829) Avail: NTIS HC A05/MF A01 CSCL 08I

The installation and maintenance of carrier phone systems in underground coal mines is described. Detailed information is also presented on specific ways to improve existing carrier phone systems. Author (GRA)

N82-21708# Geological Survey, Bismarck, N.Dak. Water Resources Div.

WATER RESOURCES DATA FOR NORTH DAKOTA, WATER YEAR 1980 Annual Water-Data Report, 1 Oct. 1979 - 30 Sep. 1980

May 1981 820 p refs Prepared in cooperation with the State of North Dakota

(PB82-129495; USGS/WRD/HD-81/046; USGS-WDR-ND-80-1) Avail: NTIS HC A99/MF A01 CSCL 08H

Water resources data for the 1980 water year for North Dakota consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This report contains discharge records for 144 gaging stations; stage only records for 22 gaging stations; stage and contents for 13 lakes and reservoirs; water quality for 87 gaging stations, 33 partial-record stations, 39 lakes, 80 wells, and water levels for 32 observation wells. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N82-21709*# ECO, Inc., Cambridge, Mass.
CATHODE CATALYSTS FOR PRIMARY PHOSPHORIC ACID FUEL CELLS Final Report
Dec. 1981 60 p refs
(Contracts DEN3-150; DE-AI01-80ET-17088)
(NASA-CR-165578; NAS 1.26:165578; DOE/NASA/150-81/7) Avail: NTIS HC A04/MF A01 CSCL 10A

Alkylation or carbon Vulcan XC-72, the support carbon, was shown to provide the most stable bond type for linking cobalt dehydrodibenzo tetraazannulene (CoTAA) to the surface of the carbon; this result is based on data obtained by cyclic voltammetry, pulse voltammetry and by release of 14C from bonded CoTAA. Half-cell tests at 100 C in 85% phosphoric acid showed that CoTAA bonded to the surface of carbon (Vulcan XC-72) via an alkylation procedure is a more active catalyst than is platinum based on a factor of two improvement in Tafel slope; dimeric CoTAA had catalytic activity equal to platinum. Half-cell tests also showed that bonded CoTAA catalysts do not suffer a loss in potential when air is used as a fuel rather than oxygen. Commercially available polytetrafluroethylene (PTFE) was shown to be unstable in the fuel cell environment with degradation occurring in 2000 hours or less. The PTFE was stressed at 200 C in concentrated phosphoric acid as well as electrochemically stressed in 150 C concentrated phosphoric acid; the surface chemistry of PTFE was observed to change significantly. Radiolabeled PTFE was prepared and used to verify that such chemical changes also occur in the primary fuel cell environment. R.J.F.

N82-21710*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MICROPROCESSOR CONTROL SYSTEM FOR 200-KILOWATT MOD-0A WIND TURBINES Final Report
Ted W. Nyland and Arthur G. Birchenough Jan. 1982 26 p refs
(Contract DE-AI01-76ET-20370)
(NASA-TM-82711; E-10006; NAS 1.15:82711; DOE/NASA/20370-22) Avail: NTIS HC A03/MF A01 CSCL 10A

The microprocessor system and program used to control the operation of the 200-kW Mod-0A wind turbines is described. The system is programmed to begin startup and shutdown sequences automatically and to control yaw motion. Rotor speed and power output are controlled with integral and proportional control of the blade pitch angle. Included in the report are a description of the hardware and a discussion of the software programming technique. A listing of the PL/M software program is given. Author

N82-21711*# ECO, Inc., Cambridge, Mass.
CATHODE CATALYST FOR PRIMARY PHOSPHORIC ACID FUEL CELLS Final Report
Fraser Walsh Dec. 1981 60 p
(Contract DEN3-150; Contract DE-AI01-80ET-17088)
(NASA-CR-165578; DOE/NASA/150-81/7; NAS 1.26:165578) Avail: NTIS HC A04/MF A01 CSCL 10A

Three carbon surface functionalization procedures were carried out on Vulcan XC-72, the support carbon in the phosphoric acid fuel cell. The resulting functionalized carbons were reacted with carbon 14-labeled trimethylamine and with carbon 14-labeled dimethylamino tetraazannulene. The release of the carbon 14 from these bonded carbons was measured. Based on the results obtained, the alkylation procedure of carbon functionalization was identified as providing the most stable bond between the carbon surface and the organic electrocatalyst. R.J.F.

N82-21712*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXPERIMENTAL PERFORMANCE OF THE REGENERATOR FOR THE CHRYSLER UPGRADED AUTOMOTIVE GAS TURBINE ENGINE Final Report
Jerry M. Winter and Ralph C. Nussle Feb. 1982 62 p refs
(Contract DE-AI01-77CS-51040)
(NASA-TM-82671; E-953; DOE/NASA/51040-32; NAS 1.15:82671) Avail: NTIS HC A04/MF A01 CSCL 10B

Automobile gas turbine engine regenerator performance was studied in a regenerator test facility that provided a satisfactory simulation of the actual engine operating environment but with independent control of airflow and gas flow. Velocity and temperature distributions were measured immediately downstream of both the core high-pressure-side outlet and the core low-pressure-side outlet. For the original engine housing, the regenerator temperature effectiveness was 1 to 2 percent higher than the design value, and the heat transfer effectiveness was 2 to 4 percent lower than the design value over the range of test conditions simulating 50 to 100 percent of gas generator speed. Recalculating the design values to account for seal leakage decreased the design heat transfer effectiveness to values consistent with those measured herein. A baffle installed in the engine housing high-pressure-side inlet provided more uniform velocities out of the regenerator but did not improve the effectiveness. A housing designed to provide more uniform axial flow to the regenerator was also tested. Although temperature uniformity was improved, the effectiveness values were not improved. Neither did 50-percent flow blockage (90 degree segment) applied to the high-pressure-side inlet change the effectiveness significantly. Author

N82-21713*# Westinghouse Electric Corp., Pittsburgh, Pa. Advanced Energy Systems Div.
CELL MODULE AND FUEL CONDITIONER DEVELOPMENT Quarterly Report, Oct. - Dec. 1981
J. M. Feret Jan. 1982 51 p
(Contract DEN3-161; Contract DE-AI01-80ET-17088)
(NASA-CR-165620; DOE/NASA/0161-9A; NAS 1.26:16562; QR-9) Avail: NTIS HC A04/MF A01 CSCL 10A

The efforts performed to develop a phosphoric acid fuel cell (PAFC) stack design having a 10 kW power rating for operation at higher than atmospheric pressure based on the existing Mark II design configuration are described. The work involves: (1) Performance of pertinent functional analysis, trade studies and thermodynamic cycle analysis for requirements definition and system operating parameter selection purposes, (2) characterization of fuel cell materials and components, and performance testing and evaluation of the repeating electrode components, (3) establishment of the state-of-the-art manufacturing technology for all fuel cell components at Westinghouse and the fabrication of short stacks of various sites, and (4) development of a 10 kW PAFC stack design for higher pressure operation utilizing the top down systems engineering approach. Author

N82-21714*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
METHOD FOR PREDICTING IMPULSIVE NOISE GENERATED BY WIND TURBINE ROTORS
Larry A. Viterna 1982 7 p refs Presented at the Intern. Conf. on Noise Control Eng., San Francisco, 17-19 May 1982
(Contract DE-AI01-76ET-20320)
(NASA-TM-82794; E-1128; DOE/NASA/20320-36; NAS 1.15:82794) Avail: NTIS HC A02/MF A01 CSCL 10B

Large wind turbines can generate both broad band and impulsive noises. These noises can be controlled by proper choice of rotor design parameters such as rotor location with respect to the supporting tower, tower geometry and tip speed. A method was developed to calculate the impulsive noise generated when the wind turbine blade experiences air forces that are periodic functions of the rotational frequency. This phenomenon can occur when the blades operate in the wake of the support tower and the nonuniform velocity field near the ground due to wind shear. Results from this method were compared with measured sound spectra taken at locations of one to two rotor diameters from

the DOE/NASA Mod-1 wind turbine. The calculated spectra generally agreed with the measured data in both the amplitude of the predominant harmonics and the roll of rate with frequency. Measured sound pressure levels far from the Mod-1 (15 rotor diameters), however, were higher than predicted. Simultaneous measurements in the near and far field indicated that the propagation effects could enhance the sound levels by more than 10 dB above that expected by spherical dispersion. These propagation effects are believed to be due to terrain and atmospheric characteristics of the Mod-1 site. Author

N82-21715# Uppsala Univ. (Sweden). Inst. of Technology.
OPTICAL PROPERTIES OF SOLIDS FOR SOLAR ENERGY CONVERSION Ph.D. Thesis
Bjoern Karlsson 1981 19 p refs Sponsored in part by the Swedish Natural Science Research Council (NFR), the Swedish Council for Building Research (BRF), and the Swedish Board for Technical Development (STU)
(ISSN-0345-0058; ISBN-91-554-1226-2) Avail: NTIS HC A02/MF A01

The optical properties of transition metal carbides and nitrides were studied by reflectance measurements between 0.2 and 15 micrometers at room temperature and up to 500 C. An interpretation of the pronounced difference between the nitrides and carbides is made from a model in the electronic density of states distribution. The model is used to explain shifts in the optical constants when carbon or nitrogen-vacancies are introduced in the nitride. Calculations based on the optical constants suggest the nitrides as a new material for transparent heat-mirrors. The refractive index and band-edge of CuO, Cu sub 2O, Fe sub 2O sub 3, Cr sub 2O sub 3, i-C and a-Si have been measured and discussed within the framework of a new model for evaluating their potential use as the absorbing layer on a tandem-selective surface. A number of oxides on copper and steel were prepared by thermal and chemical methods and investigated for use as selectively absorbing surfaces. Thin films of noble and transition metals have been prepared and optically investigated for use as semi-transparent coatings on domestic windows. Author

N82-21716# Argonne National Lab., Ill. Chemical Engineering Div.
TRANSIENT CURRENT DISTRIBUTIONS IN POROUS ZINC ELECTRODES IN KOH ELECTROLYTE
Ming-Biann Liu, Y. Yamazaki (Tokyo Inst. of Technology), G. M. Cook, and N. P. Yao Feb. 1981 73 p refs
(Contract W-31-109-eng-38)
(ANL/OEPM-80-6) Avail: NTIS HC A04/MF A01

A zero-resistance ammeter circuit with a 10 channel operational amplifier was used to measure the current distribution during a discharge of 10 to 100 mA with simulated zinc porous electrodes in 7.24 M KOH saturated with ZnO. The reaction distribution was found to be highly nonuniform, with 70 to 78% of the charge transfer reaction completed in a depth of 0.01 cm. The current distribution changes during passivation of the electrode were experimentally obtained. A mathematical model based upon a macroscope averaging technique was used to predict the time dependence of charge transfer reaction profiles. With the mathematical model, current distributions and overpotentials were predicted as a function of time for a segmented zinc electrode discharged at a current of 10 to 100 mA. A gradual decrease in the specific conductivity of the pore electrolyte to 20% of the initial value during discharge yields predictions of current distributions and overpotentials in good agreement with experimental data. B.W.

N82-21717* National Aeronautics and Space Administration, Washington, D. C.
ENERGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (ISSUE 29)
Apr. 1981 420 p
(NASA-SP-7043(29); NAS 1.21:7043(29)) Avail: NTIS HC $15.00 CSCL 10B

This bibliography lists 1360 reports, articles, and other documents introduced into the NASA scientific and technical information system from January 1, 1981 through March 31, 1981. T.M.

N82-21718# Los Alamos Scientific Lab., N. Mex.
A PASSIVE SOLAR RETROFIT STUDY FOR CONCRETE BLOCK BUILDINGS Report, Oct. 1980 - Sep. 1981
William O. Wray, Charles R. Miles (NCEL), and Claudia E. Kosiewicz Jan. 1982 28 p refs
(Contract N68305-81-MP-10003)
(AD-A110189; CEL-CR-82.007) Avail: NTIS HC A03/MF A01 CSCL 13/1

A passive solar retrofit study has been conducted for the Navy at the Los Alamos National Laboratory. The purpose of the study was to determine the energy savings obtainable in concrete block buildings from several passive solar heating and conservation strategies. A procedure involving the use of test cell data and computer simulation was employed to assess the merits of six retrofit options. The six strategies selected were chosen on the basis of providing a series of options that will deliver increasing energy savings at the cost of correspondingly increased levels of commitment. Author (GRA)

N82-21719# Naval Civil Engineering Lab., Port Hueneme, Calif.
WIND POWER UTILIZATION GUIDE Progress Report, Jul. 1975 - Sep. 1980
D. Pal Sep. 1981 218 p refs
(AD-A110337; CEL-TN-1613) Avail: NTIS HC A10/MF A01 CSCL 04/2

This report presents general information covering site wind potential and characteristics, specific design, system design, and siting requirements for utilization of wind energy conversion systems (WECS) at Navy installations. The objective of this report is also to provide a method for performing economic analysis to plan and justify a WECS in a particular Navy application. The information presented here is sufficient to enable an engineer to prepare a system's design to conduct a feasibility study for a given application of WECS. Most Navy applications of wind power will involve generation of electricity using small wind turbine generators (less than 60 kW size), with or without storage, located at remote Navy sites. Larger (over 100 kW size) WECS will, generally, be integrated with a base grid located on remote overseas or CONUS bases. This report, however, deals only with guidance for applying small WECS at Navy installations. The subject matter is divided into five parts dealing respectively with wind behavior and its determination with wind-driven turbines, power conditioning requirements, siting requirements, and the economics of wind power under different conditions. Three examples are given to demonstrate use of these sections in developing the required feasibility or design information for a given application. Author (GRA)

N82-21720# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
SOLAR ENERGY INFORMATION USER STUDY: MILITARY ENGINEERS
T. L. Marle and W. W. Belew Sep. 1981 100 p
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-001606; SERI/TR-751-1047) Avail: NTIS HC A05/MF A01

Data from questionnaires administered to military engineers and architects attending a 2 day solar design workshop are summarized. The workshop was designed to inform engineers when and where solar energy could be used more effectively. The study aimed to identify the solar energy information needs and information habits of the professionals, their familiarity with and appraisal of relevant military publications containing solar energy information currently available, and the overall effectiveness of the workshops (including structure and content). To measure the effectiveness of the workshop itself and provide input on producing an effective and comprehensive information dissemination plan for military engineers nationwide, 2 questionnaires were designed and administered to the participants. A preworkshop questionnaire assessed the participant's knowledge of solar energy prior to attending the workshop. T.M.

N82-21721# Argonne National Lab., Ill. Energy and Environmental Systems Div.
ECONOMIC ASSESSMENT OF BATTERY STORAGE IN SOLAR PHOTOVOLTAIC APPLICATIONS First-year Project Summary
R. O. Mueller, W. J. Walsh, B. K. Cha, and R. F. Giese May

1981 56 p refs
(Contract W-31-109-eng-38)
(DE82-004045; ANL/SPG-20) Avail: NTIS HC A04/MF A01

Savings attributable to batteries were evaluated for three representative US utility service areas. The photovoltaic (PV) devices were assumed capable of exporting excess power to the utility grid; and the batteries, sited at the substation, were operated as a form of load-leveling utility storage. A cost-allocation model, SIMSTOR, was employed to determine utility fuel and resulting capital cost savings. The effects of installing PV devices were evaluated. Results indicated that batteries and PV systems do not directly compete when attached to the electricity supply grid. Utility savings were primarily fuel savings; those from the batteries were savings in utility capacity. Batteries with higher discharge rates and larger storage capacities are to be favored. It was determined that lead/acid and zinc/chlorine batteries are the leading contenders in the near term. M.D.K.

N82-21722# Argonne National Lab., Ill. Chemical Engineering Div.
ADVANCED FUEL-CELL DEVELOPMENT Progress Report, Jul. - Sep. 1980
R. D. Pierce, R. M. Arons, J. T. Dusek, A. V. Fraioli, G. H. Kucera, R. B. Poeppel, J. W. Sim, J. L. Smith, and R. S. Tani Jul. 1981 37 p refs
(Contract W-31-109-eng-38)
(DE82-003007; ANL-81-16) Avail: NTIS HC A03/MF A01

Efforts were directed toward: investigating alternative concepts for components of molten carbonate fuel cell stacks; and improving out understanding of component behavior. The principal focus is on the development of sintered beta-LiAlO2 for electrolyte support and sintered Li sub x Ni sub 1-x O for cathodes. In the electrolyte development effort, both alpha- and beta-LiAlO2 were synthesized as starting material for sintered electrolyte supports, and tape casting was studied for preparing green bodies for intering. A sintering procedure was developed which produces flat NiO cathodes with good conductivity and pore structure. T.M.

N82-21723# Westinghouse Electric Corp., Pittsburgh, Pa.
EVALUATION OF GASIFICATION AND GAS-CLEANUP PROCESSES FOR USE IN MOLTEN-CARBONATE FUEL-CELL POWER PLANTS Quarterly Technical Progress Report
Gary Jablonski (Davy-McKee), M. A. Alvin, R. A. Wenglarz, and P. Patel 16 Jul. 1981 24 p refs
(Contract DE-AC21-81MC-16220)
(DE82-003207; DOE/MC-16220/T1; QTPR-1) Avail: NTIS HC A02/MF A01

A draft of the gasifier listing, a low temperature gas cleanup system listing and data acquisition for the hot gas cleaning systems listing were completed. Iron oxide, dolomite, zinc oxide, molten carbonate and other such systems were included in that listing. The molten carbonate fuel cell (MCFC) contaminant data available in the open literature are reported. Particulate and chemical species for assessing the effect of contaminants on MCFC operating characteristics are thermodynamically evaluated. Data and process insights, indispensable to the evaluation of suitable coal gas supply systems for molten carbonate fuel cell power plants are provided. DOE

N82-21724# Oak Ridge Y-12 Plant, Tenn.
HERCULES AEROSPACE FLYWHEEL TEST RESULTS
R. S. Steele, Jr., E. F. Babelay, Jr., and B. J. Sutton Jun. 1981 45 p refs
(Contract W-7405-eng-26)
(DE82-001827; Y/DX-319) Avail: NTIS HC A03/MF A01

The detailed results of the spin test evaluation of the Hercules Aerospace flywheel at the Oak Ridge Flywheel Evaluation Laboratory (ORFEL) are presented. Details of the static evaluation with radiography and measures of weight, inertia and natural frequencies are included. The flywheel was spun four times with the maximum speed being increased with each run. During the final run, the flywheel achieved 372 rps and stored 0.714 kWhr of kinetic energy at 37 Whr/kg. The ultimate speed was limited by a composite transverse strength that was somewhat lower than that used in the design of the flywheel. This resulted in internal cracking of the flywheel and, eventually, the loss of material from the outer circumference. DOE

N82-21725# Rocketdyne, Canoga Park, Calif. Flywheel Systems.
RPE-10 COMPOSITE FLYWHEEL TESTING Final Report
B. R. Ginsburg Livermore, Calif. California Univ. Lawrence Livermore Lab. 15 Jun. 1981 47 p refs
(Contract W-7405-eng-48)
(DE82-001694; UCRL-15379) Avail: NTIS HC A03/MF A01

The final report on the technical effort to test an RPE-10 composite flywheel is described. The RPE-10 composite flywheel was designed and fabricated for vehicle use under a Sandia Laboratories contract. The flywheel (Unit No. 2) was tested to a speed of 21,600 rpm, at which time the overwrap separated from the flywheel, terminating the test. The primary cause of failure was attributed to overheating in the test cell, causing a deteriorization in material properties of the epoxy bond. The RPE-10 composite flywheel Unit No. 1 was successfully tested without failure to 24,120 rmp at Oak Ridge's Y-12 Laboratory. At this speed, the rotor stored over 2.0 kilowatt hours of kinetic energy. DOE

N82-21726# Westinghouse Research and Development Center, Pittsburgh, Pa.
EMERGING MATERIAL SYSTEMS FOR SOLAR-CELL APPLICATIONS Technical Progress Report, 17 Jul. - 16 Oct. 1979
W. J. Biter and J. R. Szedon Oct. 1981 19 p
(Contract DE-AC04-79ET-23003)
(DE82-003546; DOE/ET-23003/4; TR-2) Avail: NTIS HC A02/MF A01

A thin film InP/CdS polycrystalline solar cell was developed. The use of plasma induced deposition of InP from the organometallic triethylindium resulted in incorporation of large amounts of hyrocarbons into the films. It was found that reactive sputtering of indium in a phosphine atmosphere is successful in producing polycrystalline film of InP. Plasma induced deposition with an InCl3 source, attempts at doping with zinc to obtain p type films and analysis of the composition of films are discussed. DOE

N82-21727# Arizona Univ., Tucson. Environmental Research Lab.
OFF-PEAK POWER USE IN PASSIVE SOLAR HOMES: PERFORMANCE, MONITORING, AND ANALYSIS OF PERIODIC HEATING AND COOLING IN HIGH MASS HOMES
J. F. Peck Aug. 1981 42 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 1191-7)
(DE82-900874; EPRI-EM-1966) Avail: NTIS HC A03/MF A01

The thermal performance of two passive solar homes and an identical standard home used as a control are described. The peak hour electrical demand rates of these homes are compared and off peak refrigeration of homes with large quantities of thermal mass is discussed. A computer model which is being developed to assess the potential of off peak refrigeration is also described. DOE

N82-21728# Energy Information Administration, Washington, D.C. Statistics Branch.
STATE ENERGY DATA REPORT SUPPLEMENT
27 Oct. 1981 73 p
(DE82-002996; DOE/EIA-0214/79-S) Avail: NTIS HC A04/MF A01

Selected summaries and percent changes of energy consumption by state, by principal energal sources, and by major end-use sectors are presented. DOE

N82-21729# Princeton Univ., N. J. Energy Group.
HEATING/DAYLIGHTING PROTOTYPE DEVELOPMENT, PHASE 1. PASSIVE AND HYBRID SOLAR MANUFACTURED BUILDING PROJECT COVERING RESEARCH AND COMPONENT DESIGN Final Technical Report, 1 Oct. 1978 - 31 Aug. 1981
L. L. Lindsey and Marvin K. Snyder (Butler Manufacturing Co.

Research Center) Sep. 1981 79 p refs
(Contract DE-FC02-80CS-30367)
(DE82-002097; DOE/CS-30367/6) Avail: NTIS HC A05/MF A01

The design of passive and hybrid solar space heating and daylighting into prefabricated buildings is described. Systems considered include one sided and two sided roof apertures and a wall mounted air collector system. Several storage concepts were considered, and best results are expected from using the floor slab and perhaps rock beds. A test building design is described. Performance simulation and thermal analysis on the design are described and annual performance estimates and cost estimates are made. DOE

N82-21730# DHR, Inc., Washington, D.C.
MATERIALS-RESEARCH RECOMMENDATIONS TO IMPROVE THE PERFORMANCE AND DURABILITY OF SOLAR HEATING AND COOLING SYSTEMS
Stephen Herzenberg and Richard Silberglitt 11 Sep. 1981 258 p refs
(Contract DE-AC01-80ER-30008)
(DE82-000738; DOE/ER-30008/T1) Avail: NTIS HC A12/MF A01

The type of materials research most likely to improve the durability and efficiency of future active and passive solar heating and cooling systems is analyzed. Research needs are compared with ongoing solar materials research, and the extent to which present research efforts are addressing the critical flat plate collector needs is assessed. Areas most in need of additional attention are identified. Research recommendations are made for glazing materials, selective absorbers and heat transfer fluids. DOE

N82-21731# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SAFETY PROCEDURES FOR THE 100-KW SOLAR PHOTOVOLTAIC SYSTEM AT NATURAL BRIDGES NATIONAL MONUMENT
R. F. Hopkinson Sep. 1981 47 p refs
(Contract DE-AC02-76ET-20279)
(DE82-002840; DOE/ET-20279/108) Avail: NTIS HC A03/MF A01

The 100-kWp solar photovoltaic (PV) power system at Natural Bridges National Monument is a unique electrical power-generation system and special safety guidelines were developed to govern its operation. General safety requirements are set forth to safeguard newcomers to the PV system. Procedures to be used in event of emergency, including a recommended shutdown procedure, are included together with specific safety hazards inherent in the array field, battery room, control room and inverter room. DOE

N82-21732# United Technologies Corp., South Windsor, Conn. Power Systems Div.
DEVELOPMENT OF MOLTEN-CARBONATE FUEL-CELL POWER-PLANT TECHNOLOGY Quarterly Technical Progress Report, 1 Jul. - 30 Sep. 1980
Feb. 1981 65 p
(Contracts DE-AC02-79ET-15440; DE-AC01-79ET-15440)
(DE82-002108; DOE/ET-15440/4; QTPR-4; FCR-2765) Avail: NTIS HC A04/MF A01

The design of a prototype molten carbonate fuel cell stack which meets the requirements of 1990's competitive coal fired electrical utility central station or industrial cogeneration power plants was developed. The four task areas are: (1) systems studies to define the reference power plant design; (2) cell and stack design, development and verification; (3) preparation for fabrication and testing of the full scale prototype stack; and, (4) development of the capability to operate stacks on coal derived gas. DOE

N82-21733# Exxon Research and Engineering Co., Florham Park, N.J.
CONCEPTUAL DESIGN OF A SOLAR COGENERATION FACILITY INDUSTRIAL PROCESS HEAT, CATEGORY A. EXECUTIVE SUMMARY Final Report, 10 Sep. 1980 - 14 Aug. 1981
P. Joy, Martin Brzeczek, Harold Seilestad, Carl Silverman, and George Yenetchi Jul. 1981 235 p Prepared in cooperation with Badger Energy, Inc., Martin Marietta, Denver and Pacific Gas and Electric, San Ramon, Calif.
(Contract DE-AC03-80SF-11438)
(DE82-001663; DOE/SF-11438/T1-Vol-1) Avail: NTIS HC A11/MF A01

The conceptual design of a central receiver solar cogeneration facility at a California oil field is described. The process of selecting the final cogeneration system configuration is described and the various system level and subsystem level tradeoff studies are presented, including the system configuration study, technology options, and system sizing. The facility is described, and the functional aspects, requirements operational characteristics, and performance are discussed. Capital and operating costs, safety, environmental, regulatory issues and potential limiting considerations for the design are included. Each subsystem is described in detail including a discussion of the functional requirements, design, operating characteristics performance estimates and a top level cost estimate. An economic assessment is performed to determine the near-term economic viability of the project and to examine the impact of variations in major economic parameters such as capital and operating and maintenance costs on economic viability. Two measures of economic viability used are levelized energy cost and net present value. DOE

N82-21734# Lincoln Lab., Mass. Inst. of Tech., Lexington.
INFORMATION GATHERING, DATA REDUCTION, AND INFORMATION DISSEMINATION FOR RESIDENTIAL EXPERIMENT STATION OPERATIONS
P. Raghurman and E. C. Kern, Jr. Sep. 1981 26 p refs
(Contract DE-AC02-76ET-20279)
(DE82-002157; DOE/ET-20279/141) Avail: NTIS HC A03/MF A01

The Residential Experiment Stations (RESs) were designed to develop residential photovoltaic systems and to disseminate information to the photovoltaic community, cognizant institutions and, ultimately, the public. The residential data systems are discussed that were designed specifically for the RESs to gather and process the physical data required. The specific reports are covered which will be issued and the contents of each report are listed. A sample format for each report is also presented. The appendices describe the quantities that will be measured at the monitored houses, prototype systems and initial system evaluation experiments. They also include a description of the data processing. DOE

N82-21735# Westinghouse Electric Corp., Pittsburgh, Pa. Advanced Energy Systems Div.
ROBINS AIR FORCE BASE SOLAR COGENERATION FACILITY, VOLUME 1 Final Report
Aug. 1981 321 p refs 2 Vol.
(Contract DE-AC03-81SF-11494)
(DE82-001922; DOE/SF-11494/T1-Vol-1) Avail: NTIS HC A14/MF A01

A conceptual design and cost estimate for a demonstration solar facility to generate electricity and deliver process steam to the existing base distribution systems is considered. The solar energy system is a central receiver arrangement. The technical approach to the project and the rationale for selecting the site at Robins Air Force Base are discussed. The evaluation of alternative configurations considered to have potential for improving the facility value is summarized. The solar facility is described, including system level functional requirements, design, operation, performance, cost, safety, environmental, institutional, and regulatory considerations. The design, functional requirements and operating characteristics which influence cost or performance for each subsystem are described. The subsystems are the collector, receiver/tower, master control, electric power generation, and facility steam and feedwater subsystems. DOE

N82-21736# Westinghouse Electric Corp., Pittsburgh, Pa. Advanced Energy Systems Div.
ROBINS AIR FORCE BASE SOLAR COGENERATION FACILITY, VOLUME 2 Final Report
Aug. 1981 196 p refs 2 Vol.
(Contract DE-AC03-81SF-11494)
(DE82-001866; DOE/SF-11494/T1-App-A-H) Avail: NTIS HC A09/MF A01

Eight appendices are included. The first is a facility specification which defines the characteristics, and design and environmen-

tal requirements for the facility. The facility conceptual design, performance, costs and economic data are provided as well as a description of the existing facility. The second appendix contains the drawings generated in support of the conceptual design. The third presents the MIRVAL computer code used to calculate the incident energy on the solar receiver. The fourth provides details on the predicted performance of the predicted performance of the modified steam turbine and the typical commercial turbine. The fifth contains the annual integration performance model of sizing the facility. The sixth contains steam load data projected to 1986. A computer model developed to integrate the hour-by-hour, steady-state, performance of the final conceptual cogeneration facility is given in the seventh appendix. Finally, descriptions and vendor data for the balance of the plant equipment arower, master control, electric power generation, and facility steam and feedwater subsystems. DOE

N82-21737# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

CONVINCING THE HOME BUILDER TO BUILD SOLAR HOMES: EVALUATION OF PASSIVE SOLAR WORKSHOP FOR BUILDERS

S. Klein Sep. 1981 97 p refs
(Contract DE-AC02-77CH-00178)
(DE82-001978; SERI/TR-722-892) Avail: NTIS HC A05/MF A01

In 1979-80, a pilot series of workshops for home builders was offered throughout the United States. The primary objectives of the project were to educate the home builder in passive solar design techniques, to promote favorable attitudes toward solar concepts, and to encourage builders to use solar design in residential construction. Builders and designers were targeted because they are the decision makers in the progress of commercializing solar design in new construction. The need is outlined for continued and expanded programs for builders to facilitate usage of solar design in the residential sector, based on information provided in nearly 1100 pre- and post-training forms returned. DOE

N82-21738# Automation Industries, Inc., Silver Spring, Md. Vitro Labs. Div.

SOLAR DESIGN AND INSTALLATION EXPERIENCE: AN OVERVIEW OF RESULTS FROM THE NATIONAL SOLAR DATA NETWORK

H. O. Holte and C. J. Kelly, ed. Jun. 1981 78 p refs
(Contract DE-AC01-79CS-30027)
(DE82-001657; SOLAR/0009-81/37) Avail: NTIS HC A05/MF A01

Results, conclusions and insights drawn from analysis of the various types of solar energy systems are presented. Some sites have been monitored for over four years. Performance information, derived from accurately measured field data, are presented and may be related to design data for the sites. Information is identified for such factors as the ratio of storage volume to collector area, heating and cooling load and the ratio of collector area to building floor area. DOE

N82-21739# Borg-Warner Corp., Los Angeles, Calif. Pump Div.

GUIDE TO EFFECTIVE SOLAR HEATING AND COOLING PRACTICE

P. C. Powell, H. F. Fostel, and E. P. Cody Oct. 1981 67 p
(Contract DE-AC01-79CS-30027)
(DE82-001416; SOLAR/0091-81/00) Avail: NTIS HC A04/MF A01

A detailed and systematic inventory of technical experiences at residential and commercial solar demonstration sites across the nation is provided, and design approaches are described which have been shown to dramatically improve system performance. A review was made of nearly one hundred sites which were instrumented and feeding data continuously into a solar data network. It is found that the success of individual systems in meeting or exceeding their design targets depends on effectively controlled design, installation, operation and maintenance. However, numerous reported problems have also been due to poor communication between the various parties involved, and additionally due to failure to identify problems as they develop. Overall, such factors contributed greatly to the generated underperformance seen at the sites. It is found that solar systems must be designed to operate efficiently during periods of minimum as well as peak loads. DOE

N82-21740# Boeing Co., Seattle, Wash.

SOLAR PROJECT DESCRIPTION FOR SUMMERWOOD ASSOCIATES: CONDOMINIUM RESIDENCES (M); OLD SAYBROOK, CONNECTICUT

25 Sep. 1981 62 p
(Contract DE-AB01-76CS-31020)
(DE82-000829; SOLAR/1102-81/50) Avail: NTIS HC A04/MF A01

A solar energy system for a Connecticut rowhouse residence is described. The system is as active drain down system that consists of a 340 square foot water based flat plate collection array and a 600 gal. poured concrete insulated tank for heat storage. The solar energy system provides space heat and domestic hot water for the residence. The general characteristics of the residence and a site plan are given and the solar energy system is completely described, including the collector, storage, energy to load, and auxiliary subsystems. Specific details of the system's four operating modes are discussed. The performance evaluation instrumentation of the site for the National Solar Data Network is described, and the solar energy portion of the construction costs are given. T.M.

N82-21741# Automation Industries, Inc., Silver Spring, Md. Vitro Labs. Div.

SOLAR ENERGY SYSTEM PERFORMANCE EVALUATION, OCTOBER 1980 - APRIL 1981

P. W. Kendall 1981 101 p refs
(Contract DE-AC01-79CS-30027)
(DE82-001933; SOLAR/2011-81/14) Avail: NTIS HC A06/MF A01

The energy system of a single-story, concrete block office building with 1670 square feet of conditioned space was studied. The retrofit active solar energy system is designed to supply 65% of the total heating. The system is equipped with 400 square feet of hydronic flat-plate collectors, a 2000-gallon steel tank for heat storage, and an auxiliary gas-fired boiler. The system can operate at low collection/storage temperature levels or utilize solar energy directly from storage in an oversized duct coil located in the system air handling unit. The measured solar fraction was 80%, compared to a predicted 82%. The solar savings ratio, accounting for system operating energy, was 65%. T.M.

N82-21742# Automation Industries, Inc., Silver Spring, Md. Vitro Labs. Div.

SOLAR ENERGY SYSTEM PERFORMANCE EVALUATION: TAOS STATE OFFICE BUILDING, TAOS, NEW MEXICO, OCTOBER 1980 - MAY 1981

M. L. Brauch 1981 76 p refs
(Contract DE-AC01-79CS-30027)
(DE82-001415; SOLAR/2080-81/14) Avail: NTIS HC A05/MF A01

The building has an integrated solar heating and daylighting system consisting of 2695 sq ft of clerestory window, 296 sq ft of south-facing windows and 218 sq ft of east and west window scoops. The collected energy is stored in 14,080 gallons of water in drums at ceiling level in the clerestory area as well as in the masonry construction mass of the building. Pneumatically controlled shutters are used on the clerestory windows. The system provides 67% of the heating load. T.M.

N82-21743# California Univ., Livermore. Lawrence Livermore Lab.

ECONOMIC ANALYSIS OF SOLAR INDUSTRIAL PROCESS HEAT SYSTEMS: A METHODOLOGY TO DETERMINE ANNUAL REQUIRED REVENUE AND INTERNAL RATE OF RETURN

W. C. Dickinson and Kenneth C. Brown 11 Aug. 1981 48 p refs
(Contract W-7405-eng-48)
(DE82-001628; UCRL-52814-Rev-1) Avail: NTIS HC A03/MF A01

An economic evaluation of solar industrial process heat systems, is developed to determine the annual required revenue and the internal rate of return. First, a format is provided to

estimate the solar system's installed cost, annual operating and maintenance expenses, and net annual solar energy delivered to the industrial process. The annual required revenue and the price of solar is calculated. The economic attractiveness of the potential solar investment can be determined by comparing the price of solar energy with the price of fossilfuel, both expressed in levelized terms. This requires calculation of the internal rate of return on the solar investment or, in certain cases, the growth rate of return. DOE

N82-21744# Midwest Research Inst., Golden, Colo. Thermal Research Branch.

PRELIMINARY STUDY OF THE POTENTIAL FOR PERFORMANCE IMPROVEMENTS IN SOLAR DESICCANT COOLING

Dennis R. Schlepp and Robert Barlow Oct. 1981 11 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-001544; SERI/PR-252-1416) Avail: NTIS HC A02/MF A01

A second-law thermodynamic system analysis was carried out, demonstrating that present desiccant systems only achieved 10% to 15% of theoretical maximum performance and that a large potential for improvement exists. Computer simulations were used to study the effects of improving desiccant properties and increasing the effectiveness of some components of the system. Results show that modification of desiccant properties can only produce a limited (10%) increase in COP. Larger increases can be achieved by increasing the effectiveness of the sensible heat exchanger. However, it is indicated that the key to obtaining higher COPs is in the design of the dehumidifier. One design that shows promise is the parallel passage dehumidifier. T.M.

N82-21745# Sandia Labs., Albuquerque, N. Mex.

ACTIVE AND PASSIVE COOLING FOR CONCENTRATING PHOTOVOLTAIC ARRAYS

M. W. Edenburn and Michael W. Edenburn Oct. 1981 23 p refs
(Contract DE-AC04-76DP-00789)
(DE82-003922; SAND-81-0530) Avail: NTIS HC A02/MF A01

Optimization, based on minimum energy cost, of active and passive cooling designs for point-focus Fresnel lens photovoltaic arrays and lines-focus, parabolic-trough photovoltaic arrays is discussed, and the two types of cooling are compared. Passive cooling is more cost-effective for Fresnel lens arrays while the reverse is true for parabolic-trough arrays. DOE

N82-21746# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

EXPLORATORY DEVELOPMENT OF THIN-FILM POLYCRYSTALLINE PHOTOVOLTAIC DEVICES Semiannual Topical Report, 1 Oct. 1980 - 1 Jun. 1981

Jun. 1981 56 p refs Prepared in cooperation with RCA Labs.
(Contract DE-AC02-77CH-00178)
(DE82-000092; SERI/PR-0-9100-1) Avail: NTIS HC A04/MF A01

During this period, heavy emphasis was placed on substrate and epitaxial process and reactor development since these are the major components of this approach to low-cost solar-cell modules. The substrate task seeks to apply the HEM ingot technology to commercial metallurgical grade (MG) silicon to form a substrate suitable for epitaxial growth and solar-cell fabrication. A conceptual study of three epitaxial reactor systems was conducted to provide a sound theoretical and practical basis for continued and future development of reactor systems. Initial cost projections which were conducted based on SAMICS/IPEG methodolgies indicate that attainment of the cost-goal of less than 0.50 $/Wp can be achieved. T.M.

N82-21747# RCA Labs., Princeton, N. J. Atmospheric Sciences Research Center.

AMORPHOUS SILICON SOLAR CELLS Quarterly Report, 1 Apr. - 30 Jun. 1981

D. E. Carlson, R. S. Crandall, J. Dresner, B. Goldstein, J. J. Hanak, A. R. Moore, H. E. Schade, H. A. Weakliem, and R. Williams Aug. 1981 58 p refs
(Contract DE-AC02-77CH-00178)
(DE82-001101; SERI/PR-0-9372-3; QR-1) Avail: NTIS HC A04/MF A01

DLTS measurements on both Schottky-barrier and p-i-n a-Si:H solar cells revealed a deep electron trap that could be associated with the Staebler-Wronski effect. The density of metastable defects was found proportional to the amount of oxygen and nitrogen introduced by an air bleed. Infrared absorption studies showed that recent films produced in an rf magnetron mode are comparable to films produced in rf capacitive or dc proximity modes. Auger electron spectroscopy was used to study films deposited on substrates. The Hall effect in p-type a-Si:H (0.4 at. % boron) exhibits the correct sign for temperatures < 1000C but reverses for high temperatures, thus indicating two hole conduction modes. Conversion efficiencies up to 5.2 percent were obtained for p-i-n cells with a microcrystalline p layer. Open-circuit voltages as large as 933 mV were observed in p-i-n structures with carbon-containing p layers. Diffusion length measurements were shown to be sensitive to degradation mechanisms such as electron bombardment. DOE

N82-21748# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

PHOTOVOLTAIC RESEARCH AND DEVELOPMENT: MATERIALS RESEARCH Annual Report

Paul Schissel Sep. 1981 18 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-001796; SERI/PR-641-1306) Avail: NTIS HC A02/MF A01

Program objectives, milestones, planned research topics and equipment acquisition and specifications are listed. On-going research activities are described, including principal in-house activities on thick-film metallization, photodegradation of polymeric materials, and encapsulation by electrostatic lamination of glass mirrors. DOE

N82-21749# Rockwell International Corp., Thousand Oaks, Calif.

ADVANCED PHOTOVOLTAIC CONCENTRATOR CELLS Semiannual Technical Progress Report, 1 Dec. 1980 - 31 May 1981

H. T. Yang, D. L. Miller, and S. W. Zehr Jul. 1981 44 p refs Prepared in part for Midwest Research Inst.
(Contract DE-AC02-77CH-00178)
(DE81-030978; SERI/PR-8058-2-T3; SATPR-1) Avail: NTIS HC A03/MF A01

The development of a two-junction lattice matched A/GaAs/GaAs monolithic stacked cell is reported. The optical transparency of the intercell ohmic contact was demonstrated. Work on laser bonding for intercell ohmic contacts is discussed, particularly improvement of bonding equipment and experiments. A laser bonded cascade cell has been demonstrated, as has laser annealed heterojunction ohmic contact. DOE

N82-21750# Pennsylvania State Univ., University Park. Materials Research Lab.

PHOTOVOLTAIC AND STRUCTURAL PROPERTIES OF a-Si:H THIN FILMS Quarterly Technical Report, 1 Jun. - 31 Aug. 1981

R. Messier Nov. 1981 21 p refs Prepared for Midwest Reseach Inst., Golden, Colo.
(Contract DE-AC02-77CH-00178)
(DE82-002755; SERI/PR-9227-1-T1; QTR-5) Avail: NTIS HC A02/MF A01

The physical structure of a vapor-deposited thin film is related to adatom mobility, adatom species, and bombardment effects at the growing film surface. Bombardment effects were found to be the dominant factor. For floating film potentials greater than approximately - 20V, Ar(+)-Ion bombardment results in a drastic decrease in observable film microstructure. Adatom significant bombardment. The evolution of film physical structure was studied in detail. Hydrogenated a-Si films prepared by rf-sputtering were investigated as a function of film thickness, substrate type, and roughness. The physical structure was shown to evolve with film thickness as a result of the nucleation, growth, and incomplete coalescence of island-like structures which leads to a supernetwork of larger voids. The structural evolution was essentially unaffected by substrate type for this material in which low adatom mobility is the controlling factor. M.D.K.

N82-21751# Pennsylvania State Univ., University Park. Material Research Lab.

PHOTOVOLTAIC AND STRUCTURAL PROPERTIES OF a-Si:H THIN FILMS Quarterly Technical Progress Report, 1 Dec. 1980 - 28 Feb. 1981

R. Messier and I. S. T. Tsong 1981 7 p refs Prepared for Midwest Research Inst., Golden, Colo.
(Contract DE-AC02-77CH-00178)
(DE82-002698; SERI/PR-9227-1-T3; QTPR-3) Avail: NTIS HC A02/MF A01

The substrate floating potential, V/sub s/, was measured as a function of RF-sputtering conditions using an electrostatic probe. The large negative V/sub s/ induced at low P/sub Ar/ was responsible for energetic ion-bombardment at the growing film/plasma interface. This bombardment, when below a threshold potential -20V, results in local atomic rearrangement and selective resputtering, leading to minimization of microstructure defects. Results on film characteristics vs. V/sub s/, H-implantation in c-Si, and Si-H bonding vs. P/sub H2/ and T/sub s/ lead to a more complete picture of bombardment and thermal processes in a-Si:H film formation. DOE

N82-21752# Midwest Research Inst., Golden, Colo. Photovoltaics Research Branch.

PLAN FOR A PHOTOVOLTAIC APPLIED RESEARCH LABORATORY FOR DEVELOPING COUNTRIES

Steve Hogan, K. Firor, T. Ciszek, J. Olson, and S. Wagner Oct. 1981 17 p
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-003289; SERI/TR-611-1094) Avail: NTIS HC A02/MF A01

The planning of a photovoltaic laboratory in a developing country is discussed. With a budget of $500,000, equipment and materials are purchased for a four-year period. In the fourth year 1000W (peak power) of modules will be produced from blank silicon wafers. DOE

N82-21753# Exxon Research and Engineering Co., Linden, N.J. Advanced Energy Systems Labs.

THIN-FILM POLYCRYSTALLINE SILICON SOLAR CELLS Final Report, 15 Apr. 1980 - 15 Apr. 1981

Amal K. Ghosh, Tom Feng, Daniel J. Eustace, and H. Paul Maruska Jul. 1981 78 p refs
(Contracts DE-AC02-77CH-00178; SERI XJ-0-9077-1)
(DE82-000633; SERI/TR-9077-T3) Avail: NTIS HC A05/MF A01

The highest efficiencies achieved with single crystals are 14.1% for ITO/n-SI and 13.3% of SnO2/n-Si, while the corresponding values for polysilicon are 11.2% and 10.1%. For large area single crystal devices the efficiency values are 11.7% and 11.2% for ITO and SnO2 cells, respectively, while for polysilicon the corresponding values are 9.82% and 8.55%. The lower efficiency for large area devices is mainly due to lower J sub sc and FF. Results are presented to show the optimum grid spacing required. From stability studies it is shown that there are two distinct mechanisms for degradation, one optical and the other thermal. The optical degradation could be eliminated if the cells could be protected from UV light and the thermal degradation can be prevented if the cells are operated below 100 C. DOE

N82-21754# Solar Environmental Engineering Co., Inc., Fort Collins, Colo.

CONTROLLERS FOR SOLAR DOMESTIC HOT-WATER SYSTEMS

Golden, Colo. Solar Energy Research Inst. Oct. 1981 79 p
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-003338; SERI/TR-98189-1A) Avail: NTIS HC A05/MF A01

Designers and installers of solar domestic hot water systems are provided resource information. Key functional control strategy and equipment alternatives and equipment descriptions adequate for writing effective DHW controller specifications are provided. The installer is provided adequate technical background to understand the functional aspects of the controller. Specific instructions to install, checkout, and troubleshoot the controller installation are included. DOE

N82-21755# Science Applications, Inc., McLean, Va. Solar Technology Div.

COMPARISON OF GROUND-COUPLED SOLAR-HEAT-PUMP SYSTEMS TO CONVENTIONAL SYSTEMS FOR RESIDENTIAL HEATING, COOLING AND WATER HEATING Final Report

M. K. Choi, J. H. Morehouse, and P. J. Hughes Golden, Colo. Solar Energy Research Inst. Jul. 1981 82 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-003633; SERI/TR-98288-2) Avail: NTIS HC A05/MF A01

An analysis is performed of ground-coupled stand-alone and series configured solar-assisted liquid-to-air heat pump systems for residences. The year-round thermal performance of these systems for space heating, space cooling, and water heating is determined by simulation and compared against non-ground-coupled solar heat pump systems as well as conventional heating and cooling systems in three geographic locations: Washington, DC; Fort Worth, Texas; and Madison, Wisconsin. The results indicate that without tax credits a combined solar/ground-coupled heat pump system for space heating and cooling is not cost competitive with conventional systems. Its thermal performance is considerably better than non-ground-coupled solar heat pumps in Fort Worth. Though the ground-coupled stand-alone heat pump provides 51 percent of the heating and cooling load with non-purchased energy in Fort Worth, its thermal performance in Washington and Madison is poor. DOE

N82-21756*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

GEOTHERMAL PROBABILISTIC COST STUDY

L. H. Orren, G. Michael Ziman, Sue Campbell Jones, Tom K. Lee (California Univ., San Diego), Roger Noll (California Univ., San Diego), Louis Wilde (California Inst. of Tech., Pasadena), and Venkatraman Sadanand (California Inst. of Tech., Pasadena) Aug. 1981 196 p refs Sponsored in part by NASA
(Contract DE-AI03-79ET-37116)
(NASA-CR-168757; NAS 1.26:168757; DE82-003230; DOE/ET-37116/T4) Avail: NTIS HC A09/MF A01 CSCL 10B

A tool is presented to quantify the risks of geothermal projects, the Geothermal Probabilistic Cost Model (GPCM). The GPCM model was used to evaluate a geothermal reservoir for a binary-cycle electric plant at Heber, California. Three institutional aspects of the geothermal risk which can shift the risk among different agents was analyzed. The leasing of geothermal land, contracting between the producer and the user of the geothermal heat, and insurance against faulty performance were examined. DOE

N82-21757# Northwest Michigan Human Services Angency, Traverse City.

SOLAR SPACE HEATER: DO-IT-YOURSELF MANUAL FOR LOW-COST PASSIVE SOLAR PANELS

Oct. 1981 25 p Sponsored by DOE
(DE82-003663; DOE/R5-10230/2) Avail: NTIS HC A02/MF A01

A passive solar space heating unit for installation on 20 houses of low-income families was designed and constructed. The unit was planned to be low cost and easy to construct. A brochure showing step by step construction is included. DOE

N82-21758# Cornell Univ., Ithaca, N. Y. Coll. of Agriculture and Life Sciences.

DRY FERMENTATION OF AGRICULTURAL RESIDUES Annual Report, 1 Jan. - 31 Dec. 1980

W. J. Jewell, J. A. Chandler, S. DellOrto, K. J. Fanfoni, S. Fast, D. Jackson, and R. M. Kabrick Golden, Colo. Solar Energy Research Inst. Sep. 1981 516 p refs
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-001612; SERI/TR-09038-7) Avail: NTIS HC A22/MF A01

A dry fermentation process is discussed which converts agricultural residues to methane, using the residues in their as produced state. The process appears to simplify and enhance the possibilities for using crop residues as an energy source. The major process variables investigated include temperature, the amount and type of inoculum, buffer requirements, compaction, and pretreatment to control the initial available organic compo-

nents that create pH problems. A pilot-scale reactor operation on corn stover at a temperature of 550 C, with 25 percent initial total solids, a seed-to-feed ratio of 2.5 percent, and a buffer-to-feed ratio of 8 percent achieved 33 percent total volatile solids destruction in 60 days. Volumetric biogas yields from this unit were greater than 1 vol/vol day for 12 days, and greater than 0.5 vol/vol day for 32 days, at a substrate density of 169 kg/m (3). B.W.

N82-21759# San Diego Gas and Electric Co., Calif.
HEBER GEOTHERMAL BINARY DEMONSTRATION PROJECT Quarterly Technical Progress Report, 1 Apr. - 30 Jun. 1981
G. D. VanDeMark Sep. 1981 32 p Sponsored in part by Electric Power Research Inst., Imperial Irrigation District, Calif. Dept. of Water Resources, and Southern Calif. Edison Co.
(Contract DE-FC03-80RA-50239)
(DE82-002462; DOE/RA-50239/T1) Avail: NTIS HC A03/MF A01

Work completed on the nominal 65 Megawatt (Mwe gross) Heber geothermal binary demonstration project, located at Heber, California, is documented. Topics covered include progress made in the areas of wells, fluid production and injection systems, power plant design and construction, power plant demonstration, and data acquisition and dissemination. DOE

N82-21760# Oak Ridge Associated Universities, Inc., Washington, D.C.
CENTER FOR ENERGY RESEARCH AND TECHNOLOGICAL RESOURCES FOR PUERTO RICO Ph.D. Thesis - Univ. de Puerto Rico
Petro A. MunizRivera 1981 184 p refs In SPANISH and ENGLISH
(Contract DE-AC05-76OR-00033)
(DE81-031987; DOE/TIC-11493) Avail: NTIS HC A09/MF A01

The design of an energy-efficient building is presented. Justification for the building is explained. Technical aspects of passive solar design and policies dealing with solar design are described. The layout of the building, and functions and uses of various areas of the building are detailed. DOE

N82-21761# Arizona Solar Energy Commission, Phoenix.
EVALUATION OF GEOTHERMAL ENERGY IN ARIZONA Quarterly Topical Progress Report, 1 Apr. - 30 Jun. 1981
D. H. White 1981 43 p Prepared in cooperation with Arizona State Univ., Tempe and Arizona Univ., Tucson
(Contract DE-FC03-80RA-50076)
(DE82-000127; DOE/RA-50076/T5) Avail: NTIS HC A03/MF A01

The identification and delineation of geothermal prospects, the comparison of conventional energy use patterns with geothermal sources, the preparation of area development plans and the compilation of detailed economic and energy data for each area are discussed. Current emphasis is on commercialization. DOE

N82-21762# AAI Corp., Baltimore, Md.
SOLAR PRODUCTION OF INDUSTRIAL PROCESS HOT WATER. PHASE 3: OPERATION AND EVALUATION OF THE YORK BUILDING PRODUCTS COMPANY, INCORPORATED. SOLAR FACILITY Final Report, Sep. 1978 - Sep. 1981
J. M. Bollinger, N. Kaplan, and H. A. Wilkening, Jr. Oct. 1981 94 p refs
(Contract DE-AC03-76CS-31217)
(DE82-003000; DOE/CS-31217/T7) Avail: NTIS HC A05/MF A01

The solar facility utilizes 35 collectors with a total aperture area of 8960 sq ft. The system is designed to deliver a water/ethylene glycol solution at 200 F to a heat exchanger, which, in turn, supplies water at 180 F to a rotoclave (underground tank) for the concrete block curing process. A fossil fuel boiler system also supplies the rotoclave with processed hot water to supplement the solar system. The system was operational 92.5% of the days during which the data acquisition system was functional. Sufficient solar heating was available to deliver hot water to the heat exchanger on 448 days, or 81.8% of the days on which reliable data was recorded. Total fuel saved during the three year period was 10,284 gallons. Thus, this program successfully demonstrated the technical feasibility of generating industrial process hot water with solar energy. DOE

N82-21763# United Engineers and Constructors, Inc., Philadelphia, Pa.
PRELIMINARY ENGINEERING DESIGN AND COST OF ADVANCED COMPRESSED-AIR STORAGE (ACAS) A-5 HYBRID Final Report
E. J. Sosnowicz, J. Blackman (Brown Boveri Corp., North Brunswick, N.J.), A. S. Woodhull, and P. Zaugg Aug. 1981 272 p refs
(EPRI Proj. 1699-1)
(DE82-900339; EPRI-EM-1998) Avail: NTIS HC A12/MF A01

The advanced compressed air energy (ACAS) plant investigated operates on a partial adiabatic, partial fuel fired cycle. Only a limited advancement in state-of-the-art technology is projected for this hybrid arrangement. The A-5 hybrid systems stores the heat of compression from the low pressure and intermediate pressure compressors in a thermal energy store (TES). The heat collected in the TES is available for preheating the air from the storage cavern prior to its entering the low pressure turbine combustor. This reduces the amount of fuel consumed during power generation. The fuel heat rate for the hybrid cycle is 2660 Btu/kWh as compared to approximately 4000 Btu/kWh for a conventional CAES plant. A virtual stand-off between the hybrid plant and a conventional CAES plant at 235 mills/kWh in 1990 dollars is shown. With a lower cost and increased fuel cost projections, the hybrid system operating cost is less than that for a conventional CAES plant. T.M.

N82-21764# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium). Construction Metallique Sect.
TUBULAR HEAT EXCHANGER DESIGN. COMPLEMENT TO THE REPORT MT 131
Frank Vandeberghe Nov. 1980 45 p refs Presented at Seminar on Machine Mech., Ghent, Belgium Sponsored by Inst. pour l'Encouragement de la Rech. Sci. dans l'Ind. et l'Agr.
(CRIF-MT-139) Avail: NTIS HC A03/MF A01

An interactive program for a minicomputer which calculates the thermal performance of shell and tube heat exchangers was written. The algorithms used and program data flow are described. Heat transfer and pressure drop correlations were assembled from the literature to aid in limiting the overdimensioning of heat exchangers. The user can solve design problems by updating geometrical input parametes until the desired performance criteria are reached. The behavior of a given heat exchanger in partial load or overload conditions, or an exchanger having different fluids can be checked by changing general performance criteria or fluid numbers. An example of a marine oil cooler is used to illustrate use of the program. Author (ESA)

N82-21765# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Raumfahrt.
HELIOSTAT FIELD LAYOUT FOR SOLAR THERMAL POWER PLANTS [DIE AUSLEGUNG VON HELIOSTATFELDERN FUER SOLARTHERMISCHE KRAFTWERKE]
Hartung, Kindermann, and W. Mayer Jun. 1980 15 p refs In GERMAN; ENGLISH summary
(MBB-UR-453/80-OE) Avail: NTIS HC A02/MF A01

The calculation of the optimum distribution of heliostats, serving a solar tower collector for solar thermal power generation, is considered. A theoretical basis for the problem is posed, encompassing physical characteristics of the heliostats, their number, and intensity of the reflected radiation from each unit in function of their layout. Theoretical results lead to numerical procedures (program package FAUST). Various heliostat field configurations (project EURELIOS and GAST) are then discussed and evaluated in light of this model. Author (ESA)

N82-21766# Stuttgart Univ. (West Germany). Abt. Energiewandlung und Waermetechnik.
HEAT STORAGE BY MEANS OF THERMAL DISSOCIATION REACTIONS. STORAGE SYSTEMS AND MATERIALS

[WAERMESPEICHERUNG DURCH THERMISCHE DISSOZIATIONSREAKTIONEN - SPEICHERSYSTEME UND SPEICHERMATERIALEN]
A. Nonnenmacher May 1980 50 p refs In GERMAN; ENGLISH summary
(IKE-5-213; ISSN-0173-6892) Avail: NTIS HC A03/MF A01

The reversible chemical reactions used for heat storage are classified, according to the phase of the dissociation products and storage techniques, pertaining to the respective phases. The physical principles of heat storage, the relevant thermal dissociation reactions and adsorption cycles are reviewed and the most important working media for the different reaction groups are summarized. The interaction with the storage materials is investigated and reactions of gases and fluids with solids and liquids are emphasized. Storage by adsorption media is also envisaged. Author (ESA)

N82-21767# Statens Provningsanstalt, Boraas (Sweden). Lab. fuer Fysikalisk Maetteknik.
SP-C12-301: THERMAL PERFORMANCES OF SOLAR ENERGY ABSORBERS [SP-C12-301: SOLFAANGARES TERMISKA PRESTANDA]
Hans E. B. Andersson 5 Nov. 1979 28 p In SWEDISH
(SP-MET-1979:2) Avail: NTIS HC A03/MF A01

The testing scheme applies to the case of absorbers where the heat carrier is a liquid passing from a single inlet to a single outlet. The absorbers are intended as part of a roof and must be tested in a standardized construction. Thermal efficiency, losses and the influence of the angle of incidence are discussed. The total solar flux in the plane of the absorber must be at least 600 W/sqm, normally 800 to 1100 W/sqm. A Sun-simulator may also be used for testing. Author (ESA)

N82-21768# Technical Research Centre of Finland, Espoo. Reactor Lab.
EVALUATION OF THE VUILLEUMIER HEAT PUMP FOR HEATING APPLICATIONS
Mikko Nykyri and Pekka Hiismaeki Aug. 1981 40 p refs
(VTT-RR-15/81; ISBN-951-38-1287-1; ISSN-0358-5077) Avail: NTIS HC A03/MF 01

The feasibility and limitations of a Vuilleumier heat pump used for heating houses are discussed. Mathematical models of an idealized pump are used to analyze heat transfer problems at hot, intermediate, and cold operating temperatures. Solid gas heat transfer at low and intermediate temperatures poses most problems. The performance coefficient is limited (the ratio of the heat rejected at the intermediate temperature to the heat supplied at the high temperature) to 1.9. The pressure level must be dropped to comply with safety regulations.
Author (ESA)

N82-21769# Esser (Klaus) G.m.b.H. and Co. K.G., Duesseldorf (West Germany).
SOLAR COLLECTORS FOR FLAT ROOFS
G. Dohse and G. Reisewitz Aug. 1980 23 p Transl. into ENGLISH of "Sonnerkollektoren fuer Flachdacher" Rept. BMFT-FB-T-80-043-E West Germany Sponsored Bundeministerium fuer Forschung und Technologie
(PB82-129834; BMFT-FB-T-80-043-E) Avail: NTIS HC A02/MF A01 CSCL 13A

The development and construction of solar collectors for flat roofs and the testing of their service life was discussed. The problematic nature of installation techniques, which meet technical requirements and guarantee good operation, as well as optimization of collector parts was discussed. A technically and economically satisfying solution to the problem of linking up the collector was found. GRA

N82-21770# Resource Planning Associates, Inc., Washington, D. C.
CONSUMPTION TREND ANALYSIS IN THE INDUSTRIAL SECTOR: EXISTING FORECASTS Final Report, Nov. 1980 - Aug. 1981
Aug. 1981 72 p
(Contract GRI-5014-310-0238)
(PB82-137829; GRI-80/0090; RPA-RA-80-0429-3) Avail: NTIS HC A04/MF A01 CSCL 10A

The Gas Research Institute (GRI) is engaged in medium- to long-range research and development in various sectors of the economy that depend on gasing technologies and equipment. To assess the potential demand for natural gas in the industrial sector, forecasts available from private and public sources were compared and analyzed. More than 20 projections were examined, and 10 of the most appropriate long-range demand forecasts were analyzed and compared with respect to the various assumptions, methodologies and criteria on which each was based. GRA

N82-21771# Honeywell, Inc., Roseville, Minn. Technology Strategy Center.
GAS LINE PZT POWER TRANSDUCER Final Report, Oct. 1980 - Jun. 1981
W. B. Kude and A. A. Gossler Aug. 1981 39 p
(Contract GRI-5080-35-0321)
(PB82-133323; HONEYWELL-81401) Avail: NTIS HC A03/MF a01 CSCL 10B

An evaluation of power requirements for automatic or remote gas meter reading and a study of the possible sources of power generation to meet those requirements were conducted. The study found that employing lead zirconium titanium (PZT) needs to convert acoustic energy accompanying gas lines to electrical power is infeasible. Insufficient power is generated by this method due to the incompatible characteristics of broadband acoustic energy and frequency specific PZT efficiency. Only the mechanical energy stored in the compressed gas is found to be sufficient to power meter reading systems. This mechanical energy can be tapped at two locations. A small turbine or piston engine placed upstream of or in lieu of the final pressure regulators would generate ample power for meter reading. Using gas meters as engines to generate power also is sufficient. GRA

N82-21772# Science Research Council, Chilton (England).
ENERGY STORAGE: A SHORT LIST OF INTERESTED PARTIES, 1981 AND THE STORAGE OF ENERGY; A WALL CHART
F. M. Russell 1981 29 p refs
(PB82-132069; RL-81-067) Copyright. Avail: NTIS HC A03/MF A01 CSCL 10C

The storage of energy is an important feature of all industrialized activity and is increasing in importance rapidly as attempts are made to conserve energy and to use energy more efficiently in both industrial and domestic applications. In April 1981 an International Conference on Energy Storage was co-sponsored by SERC, BHRA and ETSU. As part of the SERC contribution to that conference an analysis was made of the activities and interests of the conference participants relevant to energy storage. This short list of parties interested in energy storage was made available to conference delegates but it is believed that a wider distribution of this information may be of use to others who may be either currently active or contemplating initiating work in this area. GRA

N82-21773# Office of Technology Assessment, Washington, D. C.
TECHNOLOGY AND SOVIET ENERGY AVAILABILITY
Nov. 1981 415 p
(PB82-133455; LC-81-600166) Avail: NTIS HC A18/MF A01 CSCL 10A

This study addresses in detail the significance of American petroleum equipment and technology to the U.S.S.R. and the resulting options for U.S. policy. It examines the problems and opportunities that confront the U.S.S.R. in its five primary energy industries: oil, gas, coal, nuclear, and electric power. It discusses plausible prospects for these industries in the next ten years; identifies the equipment and technology most important to the U.S.S.R. In these areas; evaluates the extent to which the United States is the sole or preferred supplier of such items and analyzes the implications for both the entire Soviet bloc and the Western alliance of either providing or withholding Western equipment and technology. GRA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N82-21774*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LABORATORY UPWELLED RADIANCE AND REFLECTANCE SPECTRA OF KERR RESERVOIR SEDIMENT WATERS
William G. Witte, Charles H. Whitlock, W. Douglas Morris, and E. A. Gurganus Mar. 1982 22 p refs
(NASA-TP-1993; L-14992; NAS 1.60:1993) Avail: NTIS HC A02/MF A01 CSCL 13B

Reflectance, chromaticity, and several other physical and chemical properties were measured for various water mixtures of bottom sediments taken from two sites at Kerr Reservoir, Virginia. Mixture concentrations ranged from 5 to 1000 ppm by weight of total suspended solids (TSS) in filtered deionized tap water. The two sets of radiance and reflectance spectra obtained were similar in shape and magnitude for comparable values of TSS. Upwelled reflectance was observed to be a nonlinear function of TSS with the degree of curvature a function of wavelength. Sediment from the downstream site contained a greater amount of particulate organic carbon than from the upstream site. No strong conclusions can be made regarding the effects of this difference on the radiance and reflectance spectra. Near-infrared wavelengths appear useful for measuring highly turbid water with concentrations up to 1000 ppm or more. Chromaticity characteristics do not appear useful for monitoring sediment loads above 150 ppm. Author

N82-21775# Materials Research Labs., Melbourne (Australia).
MYTILUS EDULIS AS AN INDICATOR OF TRACE METAL POLLUTION IN NAVAL DOCKYARD WATERS WITH PRELIMINARY RESULTS FROM WILLIAMSTOWN NAVAL DOCKYARD, VICTORIA
Ian C. Dunstan, Albert deForest, and Russell W. Pettis (Monsanto Australia Ltd., West Footscray, Victoria) Jul. 1980 18 p refs
(MRL-R-781) Avail: NTIS HC A02/MF A01

Literature on the accumulation of trace metals by marine organisms suggest Mytilus edulis as a potential indicator of trace metal levels. A technique for trace metal determination in mussel tissue was developed and used for the determination of Pb, Zn, Cu, Cd, Ni, Mn, Ag, Fe and Co in whole tissues and individual organs of mussels. From these results, the stability of M. edulis as an indicator of trace metal pollution in dockyard waters is assessed. T.M.

N82-21776# California Univ., Irvine, Dayton, Ohio.
USE OF UNICELLULAR ALGAE FOR EVALUATION OF POTENTIAL AQUATIC CONTAMINANTS Annual Report, 1 Jun. 1980 - 31 May 1981
Jan Scherfig, Peter Dixon, Marc A. Petty, and Jeff C. Parsons Wright-Patterson AFB, Ohio AMRL Dec. 1981 44 p refs
(Contract F33615-80-C-0512; AF Proj. 6302)
(AD-A110222; AFAMRL-TR-81-79; AR-1) Avail: NTIS HC A03/MF A01 CSCL 06/2

Selenastrum capricornutum was used as test algae in bioassays to determine the toxic effects of potential aquatic contamination which might result from the use of conventional JP-4, JP-8 and Shale-Derived JP-8 with and without clay treatment. Chemical analyses were performed to evaluate the fate of water soluble fractions, and preliminary investigations were conducted to determine the relative toxicities of the emulsified versus dissolved fractions of the compounds studied. Techniques and protocols are described and the results are discussed. Author (GRA)

N82-21777# National Academy of Sciences - National Research Council, Washington, D. C. Committee on Hearing Bioacoustics and Biomechanics.
ASSESSMENT OF COMMUNITY RESPONSE TO HIGH-ENERGY IMPULSIVE SOUNDS
William J. Galloway Jul. 1981 32 p refs
(AD-A110110) Avail: NTIS HC A03/MF A01 CSCL 20/1

A dose-response relationship between day-night average C-weighted sound level and average degree of community annoyance is proposed for high-energy impulsive sounds. This proposal revises the relationship originally recommended in a NRC-CHABA report (1977) to reflect more recent community response data and additional analyses of previous data. The use of sound level-weighted population as a means for assessing noise impact, as originally proposed by CHABA, is retained in this proposal. Author (GRA)

N82-21778# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
A POLLUTION ABATEMENT CONCEPT: EVALUATION OF ECO-TRC CHROMIC ACID RECOVERY SYSTEM
H. J. Lee, S. OBrien (Naval Air Rework Facility, Jacksonville, Fla.), and H. M. Gundersen (Naval Air Rework Facility, Jacksonville, Fla.) 16 Sep. 1981 22 p
(AD-A109893; NADC-81172-60) Avail: NTIS HC A02/MF A01 CSCL 07/3

The evaluation of a short bed rapid cycle ion exchange concept for pollution control at the source has been completed. An ECO-TEC short bed rapid cycle ion exchange unit Model C12, was installed in a chromium electroplating line. The unit is designed to remove chromic acid and particulate matter from the first rinse tank and return purified water to the second rinse. It should recover 99% of the chromic acid input into the unit. This report is a critique on work done which is presented as Appendix A of this report. GRA

N82-21779# National Oceanic and Atmospheric Administration, Boulder, Colo. Office of Marine Pollution Assessment.
AN ASSESSMENT OF GREAT LAKES AND OCEAN POLLUTION MONITORING IN THE UNITED STATES. FEDERAL PLAN FOR OCEAN POLLUTION RESEARCH DEVELOPMENT AND MONITORING, FISCAL YEAR 1981 - 1985
Douglas A. Segar (SEAMOcean, Inc.) Aug. 1981 122 p refs
(PB82-126657; NOAA-OMPA-WP-7; NOAA-81092517) Avail: NTIS HC A06/MF A01 CSCL 13B

The need to address marine pollution monitoring needs and priorities separately from research and development was identified. Accordingly, a series of regional workshops addressing marine pollution monitoring needs was planned. The workshops were intended to address broad objectives concerning the development of guidelines, strategies, and approaches for interelating operational ocean pollution monitoring programs and findings in order to improve overall effectiveness and minimize costs. Findings of the six regional workshops in relation to the national marine pollution goals set forth by the Congress in PL 95-273 and other legislation are summarized and reported. GRA

N82-21780# General Electric Co., Schenectady, N. Y. Energy Systems Programs Dept.
ELECTROCYCLONE DEVELOPMENT PROGRAM Quarterly Technical Report, May - Jul. 1981
1981 26 p
(Contract DE-AC21-80ET-17091)
(DE81-030004; DOE/ET-17091/T3; FE-7091-14) Avail: NTIS HC A03/MF A01

An electrostatically augmented cyclone high efficiency, high throughout gas cleanup device for pressurized fluidized bed application is discussed. The use of large electrocyclones, with individual lockhopters and inlet/outlet ducts, will avoid the plugging and flow imbalance problems. The electrocyclone development program addresses three critical development areas: (1) performance scaleup; (2) performance at high temperature and pressure; and (3) corona charging. The performance at high temperature and pressure will be demonstrated by actual PFB tests on an 18 in. model geometrically identical to the earlier cold flow model. Preferred electrode geometries and the effects of alkali metal salt vapor on corona current under controlled conditions are determined. The electrocyclone PFB test will confirm the design approach and corona charger performance. DOE

N82-21781# California Univ., Livermore. Lawrence Livermore Lab.
SEDIMENTATION PLAN TO ASSESS THE IMPACT GEOTHERMAL ACTIVITIES TO THE AQUATIC ECOSYSTEM IN THE GEYERS CALISTOGA KGRA
Robert R. Ireland 19 May 1981 45 p

(Contract W-7405-eng-48)
(DE82-001688; UCID-19059) Avail: NTIS HC A03/MF A01

The prevention of sedimentation or siltation in aquatic ecosystems is always a key enviromental issue in the development and operation of power plant units. A field program, which will assess the amount of sedimentation in the streams and tributaties of the Geysers-Calistoga Known Geothermal Resource Area (KGRA) due to development-related or other site-specific activities. This sediment plan is one part of a four part venture - the others are water quality, benthic invertebrates and fisheries studies. Included are the cost breakdowns for each phase, maps and rationale of the sampling sites, the methodology for the laboratory sample processing, and examples of the type of graphic and tabular output expected. T.M.

N82-21782# California Univ., Livermore. Lawrence Livermore Lab.

BASELINE HEALTH EFFECTS DATA APPLICABLE TO ANTICIPATED GEOTHERMAL RESOURCE DEVELOPMENT IN IMPERIAL COUNTY Final Report

Margaret Deane and Jeffrey L. Hahn Jun. 1981 17 p Prepared in cooperation with California Dept. of Health Services
(Contract W-7405-eng-48)
(DE82-001669; UCRL-15391) Avail: NTIS HC A02/MF A01

The effects of budget cuts on the original contract proposal are described. A task by task description of the program is presented including results and outcome of the task. DOE

N82-21783# California Univ., Livermore. Lawrence Livermore Lab.

IMPERIAL COUNTY BASELINE HEALTH SURVEY POTENTIAL IMPACT OF GEOTHERMAL ENERGY

Margaret Deane (Calif. State Dept. of Health Services) Jun. 1981 169 p
(Contract W-7405-eng-48)
(DE82-001672; UCRL-15392) Avail: NTIS HC A08/MF A01

The survey purpose, methods, and statistical methods are presented. Results are discussed according to: area differences in background variables, area differences in health variables, area differences in annoyance reactions, and comparison of symptom frequencies with age, smoking, and drinking. Included are tables of data, enumeration forms, the questionnaire, interviewer cards, and interviewer instructions. T.M.

N82-21784# Automation Industries, Inc., Silver Spring, Md. Vitro Labs. Div.

ENVIRONMENTAL DATA FOR SITES IN THE NATIONAL SOLAR DATA NETWORK

Sep. 1981 108 p refs
(Contract DE-AC01-79CS-30027)
(DE82-001592; SOLAR/0010-81/09) Avail: NTIS HC A06/MF A01

Information is presented in the form of tables for each solar site. The sites are grouped into 12 zones, each of which consists of several adjacent states. The insolation table presents the total, diffuse, direct, maximum, and extraterrestrial radiation for the solar site. It also shows the ratio of total to extraterrestrial radiation, as a percent. The temperature table gives the average, daytime, nighttime, maximum, minimum and inlet-water temperatures for the solar site. All of the passive and some of the active solar sites are equipped with wind sensors which provide information for two wind tables furnishing wind speed and direction. For some sites, a humidity table provides relative humidity values for day and night. It also gives values for the maximum and minimum humidity for each day. A technical discussion of the instruments and measurements used to obtain these data tables is included. T.M.

N82-21785# Systems Applications, Inc., San Rafael, Calif.

CONTROL OF NITROGEN OXIDES: ASSESSMENT OF NEEDS AND OPTIONS, TECHNICAL SUPPORT DOCUMENT. VOLUME 3: ATMOSPHERIC PHYSICAL PHENOMENA RELEVANT TO NOx CONCENTRATION Final Report

R. W. Bergstrom, J. P. Killus, and T. W. Tesche Sep. 1981 161 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 1375)
(DE82-900887; EPRI-EA-2048-Vol-3) Avail: NTIS HC A08/MF A01

Information required by electric utility readers to contend with several pending NO sub x related regulatory changes is presented. The physical and chemical processes that affect power plant No sub x emissions once they are released into the air are described. A compendium of relevant nitrogen-bearing compounds and their important reactions is presented. Significant issues resulting from this chemistry are defined for the near source, local, and regional areas. Near source concentrations largely reflect emissions. Most power plant sources of No sub x emit primarily NO. NO2 can be formed by the oxidation of NO by O2 (at high concentrations of NO) and by the oxidation of NO by O3 (which produces an ozone deficit). If the NO sub x emissions mix with air containing a substantial amount of hydrocarbons, photochemical smog reactions can result and produce additional pollutants such as O3, PAN, and nitric acid. Acid rain, nitrate formation, and NO/sub x/ participation in hazy masses of polluted air are considered. T.M.

N82-21786# Systems Applications, Inc., San Rafael, Calif.

NO SUB x REGULATORY CHANGES AND THE ELECTRIC UTILITY: A GUIDANCE MANUAL FOR AIR QUALITY MODELING IN PLANNING, SITING, AND EMISSIONS CONTROL Final Report

S. R. Hayes, P. D. Gutfreund, S. D. Reynolds (KVB, Inc., Irvine, Calif.), R. Pease (KVB, Inc., Irvine, Calif.), and L. Muzio Sep. 1981 149 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 1375)
(DE82-900966; EPRI-EA-2050) Avail: NTIS HC A07/MF A01

Several regulatory changes that are likely to influence requirements for the control of nitrogen oxide emissions from power plants are discussed. The possible requirement for a short-term ambient standard for NO2, prevention of significant deterioration rules for NO2, and visibility protection regulations are also discussed. A guidance manual, a reference document designed primarily for the utility reader, is presented. The potential implications of the possible NO/sub x/-related regulations, current regulatory and permitting requirements, and surveys of NO/sub x/ control technology costs and capability are evaluated. The conduct of a NO2 air quality impact analysis is also discussed. Other topics presented include: a modeling strategy; screening analysis; and selection of appropriate models, data requirements, and costs. M.D.K.

N82-21787# National Physical Lab., Teddington (England). Acoustics Unit.

A CASE STUDY OF ENVIRONMENTAL NOISE EVALUATION

R. F. Higginson and A. J. Rennie Apr. 1980 36 p refs
(NPL-Ac-96; ISSN-0143-7143) Avail: NTIS HC A03/MF A01

The noise in the neighborhood of a hovercraft terminus was measured and quantified using the equivalent continuous sound level, L sub eq. A number of different sources of noise are heard in the area concerned. The measurements were made to demonstrate how levels of the total noise can be determined from limited measurements of the components and how a noise prediction formula can be established. Frequency spectra of hovercraft noise were examined. Data from the L sub AX measurements at various positions were fitted using an empirical formula developed from a multiple regression analysis involving four independent propagation factors. Results show that the evaluation of individual components of a noise environment can be made and the magnitudes of individual noise events determined by their single event noise exposure levels. Author (ESA)

N82-21788# Rolls-Royce Ltd., Derby (England).

THE IMPACT AND FUTURE DIRECTION OF AIRCRAFT NOISE CERTIFICATION

M. J. T. Smith 1980 29 p refs Presented at 1980 Intern. Conf. on Noise Control Eng., Miami, Dec. 1980
(PNR-90053) Avail: NTIS HC A03/MF A01

The impact of soaring fuel costs and environmental quality pressures is discussed. After a decade of noise legislation, little real improvement has been made. The current growing emphasis on noise footprints has scared manufacturers and operators into believing that a second more powerful certification process at

the airport could soon be brought into force. Existing legislation will either be replaced by newer legislation in the nineteen eighties or will become more effective. A better adaptation of existing procedures is suggested which would eliminate the need for secondary controls around airports, the operator and the airport managers judging for themselves the real impact of a new aircraft within the designated route structure. Author (ESA)

N82-21789# Defence Research Information Centre, Orpington (England).
IMPACT OF POLLUTION ON A MEDITERRANEAN COASTAL ECOSYSTEM. PART 2: RELATIONSHIPS BETWEEN SPECIFIC COMPOSITION OF PHYTOPLANKTON POPULATIONS AND LEVELS OF PIGMENTS AND ADENYLIC NUCLEOTIDES (ATP, ADP, AMP)
P. Benon and F. Blanc Jan. 1981 26 p refs Transl. into ENGLISH from Intern. Revue der Gesamten Hydrobiol. (France), vol. 65, no. 5, 1977 p 631-648
(DRIC-T-6120; BR75897) Avail: NTIS HC A03/MF A01

The influence of the discharge of fresh water (of fluvial, industrial, or domestic sewage origin) on the biological and mineral composition of a semi-enclosed sea was investigated. Discharges into the Gulf of Fos in France produced both quantitative and qualitative eutrophication and dystrophy changes in phytoplankton composition and its mass physiology via pigments (chlorophyll and pheophytine) and andenylic nucleotides. It was found that the penetration of fresh water produced a marked domination of a small number of species and of small sized species, low indices for specific diversities, and a high level of mortality. The influence of continental water was found to diminish in the SE of the Gulf where the phytoplankton populations were much more structured. Author (ESA)

N82-21790# United Nations Environment Program. Industry and Environment Office.
GUIDELINES FOR ASSESSING ENVIRONMENTAL IMPACT AND ENVIRONMENTAL CRITERIA FOR THE SITING OF INDUSTRY, VOLUME 1 Industry and Environment Guideline Series
1980 136 p refs
(ISBN-92-807-1015-X) Avail: NTIS HC A07/MF A01; UN Environment Program, Paris $20

An administrative framework is provided within which an environmental impact assessment can be carried out. Procedures for setting up an investigation; methodology; pollution and ecological effects; socioeconomic effects; and the use of specialists, are considered. Author (ESA)

N82-21791# Industrial Environmental Research Lab., Cincinnati, Ohio. Interagency Research Group on Indoor Air Quality.
INVENTORY OF CURRENT INDOOR AIR QUALITY RELATED RESEARCH
C. Beat Meyer, comp. and Robert B. Hartley, ed. Apr. 1981 199 p refs Sponsored in part by DOE
(PB82-127952; EPA-600/7-81-119) Avail: NTIS HC A09/MF A01 CSCL 13B

The inventory lists a total of 171 current or recently complete projects relating to indoor air quality. It covers six specific areas of research: monitoring, instrumentation, health effects, control technology, risk assessment and pollutant characterization. It is cross-referenced to the following pollutant groups: radon, nitrogen oxides, carbon monoxide, formaldehyde, asbestos, respirable particulates, organics, tobacco smoke, odor, ozone, biological pollutants and multipollutant studies. Information provided for each project includes the name of the principal investigator, project sponsor, funding level and abstract. The inventory is designed to be a useful tool for researchers in the field of indoor air pollution and for analysts, architects, builders and administrators who need to understand the problem, as well as possible solutions. GRA

N82-21792# Environmental Protection Agency, Ann Arbor, Mich. Test and Evaluation Branch.
CARBON MONOXIDE EPISODES
Mark Wolcott Nov. 1981 13 p refs
(PB82-131509; EPA-AA-TEB-EF-82-3) Avail: NTIS HC A02/MF A01 CSCL 13B

Since most CO emissions result from the operation of motor vehicles, high CO concentrations are associated with the congested areas of large urban, central business districts. In the presence of moderate winds and in the absence of a continuing source of emissions, ambient CO concentrations diminish fairly quickly. High concentrations measured during evening rush hour traffic, for example, often diminish to background concentration levels between three and six a.m. Against this background certain meteorological conditions could cause CO to accumulate over a large area. If such meteorological conditions persisted long enough, background levels might eventually become a significant proportion of the total CO budget. This would imply that CO is not only a hot spot (localized) problem, but is sometimes an area wide problem as well. GRA

N82-21793# National Oceanic and Atmospheric Administration, Boulder, Colo.
REPORT OF GREAT LAKES REGIONAL WORKSHOP ON OCEAN POLLUTION MONITORING
Mimi Becker and James W. Cowden Jun. 1981 166 p refs Workshop held in Ann Arbor, Mich., 10-12 Feb. 1981 Prepared in cooperation with Great Lakes Tomorrow, Hiram, Ohio
(PB82-126145; NOAA-81092513) Avail: NTIS HC A08/MF A01 CSCL 13B

The adequacy of present Great Lakes monitoring programs was determined, the existing data management system, was assessed; priorities for monitoring programs were established and alternatives and strategies to meet local and regional needs for monitoring and information management were identified. GRA

N82-21794# Ohio River Basin Commission, Cincinnati.
GREEN RIVER BASIN: REGIONAL WATER AND LAND RESOURCES PLAN AND ENVIRONMENTAL IMPACT STATEMENT
Sep. 1981 186 p refs Revised Sponsored by Water Resources Council
(PB82-126046) Avail: NTIS HC A09/MF A01 CSCL 13B

The revised plan for the Green River Basin regional water and land resource plan is described. Included is a summary of the environmental impact assessment. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N82-21795 Academy of Sciences (USSR), Moscow. Space Research Inst.
ON THE MEASUREMENT OF THE RELATIVISTIC GRAVITATIONAL EFFECT ASSOCIATED WITH THE EARTH'S ROTATION
V. B. Braginsky and A. G. Polnarev 1981 23 p refs Submitted for publication
(Rept-647) Copyright. Avail: Issuing Activity

It is demonstrated that the relativistic gravitational effect associated with the Earth's rotation can be observed in a terrestrial laboratory. A realistic scheme of such an experiment is proposed. R.J.F.

N82-21796*# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
APPLICATIONS TO EARTH PHYSICS: VERY-LONG-BASELINE INTERFEROMETRY AND DATA ANALYSIS Final Technical Report, 1 Apr. 1974 - 15 Mar. 1982
Charles C. Counselman, III and Irwin I. Shapiro Apr. 1982 197 p refs
(Contract NGR-22-009-839)
(NASA-CR-168743; NAS 1.26:168743) Avail: NTIS HC A09/MF A01 CSCL 08G

A range of very long baseline interferometry experiments applied to Earth physics are covered. N.W.

N82-21797*# California Inst. of Tech., Pasadena. Div. of Geological and Planetary Sciences.

RESEARCH IN ATMOSPHERIC CHEMISTRY AND TRANSPORT Final Report, 15 Sep. 1978 - 14 Jan. 1982
Yuk L. Yung 14 Jan. 1982 26 p refs
(Grant NsG-5301)
(NASA-CR-168747; NAS 1.26:168747) Avail: NTIS HC A03/MF A01 CSCL 04A

The carbon monoxide cycle was studied by incorporating the known CO sources and sinks in a tracer model which used the winds generated by a general circulation model. The photochemical production and loss terms, which depended on OH radical concentrations, were calculated in an interactive fashion. Comparison of the computed global distribution and seasonal variations of CO with observations was used to yield constraints on the distribution and magnitude of the sources and sinks of CO, and the abundance of OH radicals in the troposphere. Author

N82-21798# Helsinki Univ. of Technology, Espoo (Finland). Inst. of Physics.
ON THE GRAVIMETRIC INVERSION PROBLEM
D. O. Riska 1981 30 p refs
(Rept-129) Avail: NTIS HC A03/MF A01

The multipole expansion series for the gravitational potential and acceleration anomalies on the flat surface of the Earth due to a subterranean body of finite extent are inverted. Explicit formulae for the multipole moments are given in terms of the potential and acceleration components on the surface. Finally a model independent method for the determination of the shape of a starlike body of fixed density from the multipole moments is presented. The results lead to a constructive approach to the inversion problem of gravimetry and also indicate an optimal set of measurement points. Author

N82-21799# Council for Scientific and Industrial Research, Pretoria (South Africa).
ON GEOMORPHOLOGICAL CONVERGENCES. THE CASE OF THE NAMIB DESERT RELIEF (SKELETON COAST AND CENTRAL NAMIB DESERT - SOUTH WEST AFRICA/NAMIBIA)
Uwe Rust 1981 21 p Transl. into ENGLISH from Mitt. der Geograph. Ges. (Munich), v. 64, 1979 p 201-216 Presented at the 42nd German Geographic Meeting, Goettingen, West Germany, 5 Jun. 1979
(CSIR-Trans-1583) Avail: NTIS HC A02/MF A01

Convergence of forms and processes are studied in relation to geomorphological evidence found in the Namib desert. The concept of 'convergence' as a current principle is emphasized. The formation of sharp edged debris by gypsum wedging is compared with the formation of debris by frost wedging in a periglacial environment. In the Namib desert the gypsum wedging which results in material disintegration is linked to gypseous crust formation, and therefore rocks with different genetics can be solidly united by this crust. Important differences between the formative requirements in the Namib desert and in the periglacial environment are mentioned. Time as a factor is very important when it comes to obtaining an understanding of geomorphological convergences. S.L.

N82-21800# Boston Coll., Chestnut Hill, Mass. Space Data Analysis Lab.
ANALYSIS OF PROJECT EXCEDE II CIRCULAR VARIABLE FILTER SPECTROMETER DATA Scientific Report, 1 Jul. 1979 - 30 Sep. 1981
William F. Grieder and Carol I. Foley Hanscom AFB, Mass. AFGL 1 Jan. 1981 150 p refs
(Contract F19628-79-C-0139; AF Proj. 7670)
(AD-A109894; BC-SDAL-80-3; AFGL-TR-81-0224; SR-1) Avail: NTIS HC A07/MF A01 CSCL 20/6

EXCEDE 2 is the fourth in a series of research experiments conducted by Air Force Geophysics Laboratory (AFGL) to study the infrared emission processes induced by rocketborne electron accelerators. The excitation of the upper atmosphere by the electron beam simulates aurora induced processes but provides the advantage that the dosing is more precisely quantified than in the natural auroral case. In addition, optical/infrared instruments carried onboard the same payload with the accelerator provide controlled viewing geometry of the induced emissions and measurements do not suffer from long path atmospheric attenuation as would be the case for some ground based observations. GRA

N82-21801# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Information Transmission Branch.
BARIUM CLOUD TEST IN PERU Interim Report, Mar. - Apr. 1979
Allen L. Johnson and Roger L. Swanson Nov. 1981 24 p refs
(AF Proj. 1227)
(AD-A110051; AFWAL-TR-81-1178) Avail: NTIS HC A02/MF A01 CSCL 04/1

In an effort to investigate the mechanism causing ionospheric irregularities to form in the equatorial region an experiment was designed by the Max Planck Institute involving the release of two barium clouds in the F region just after sunset. The electric field resulting from the two barium clouds was expected to trigger an ionospheric irregularity which would propagate up through the ionosphere as a depletion bubble. This report describes an attempt to observe the ionospheric irregularity as it passed through the line-of-sight between an aircraft and a communication satellite. The aircraft was equipped with a UHF receiver which measured phase and amplitude of the downlink satellite signal. Due to the release of the barium 50 km below the planned altitude no significant ionospheric irregularities were formed. The aircraft measured minor amplitude variation (1dB) and no significant phase variations resulting from ionospheric irregularities triggered by the barium release. Author (GRA)

N82-21802# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex. Atmospheric Science Lab.
WATER VAPOR ABSORPTION COEFFICIENTS AT HF LASER WAVELENGTHS. PART 2: DEVELOPMENT OF THE MEASUREMENT SYSTEM AND MEASUREMENTS AT SIMULATED ALTITUDES TO 10 KM Final Report
Robert L. Spellicy, Laura J. Crow, and Kenneth O. White Nov. 1981 65 p refs
(DA Proj. 1L1-61102-B-53-A)
(AD-A110397; ERADCOM/ASL-TR-0099) Avail: NTIS HC A04/MF A01 CSCL 07/4

A unique differential photoacoustic system is described along with water vapor absorption measurements made at HF laser lines. The photoacoustic system is capable of determining absorption coefficients to .005/km. Comparisons of the data with calculated values based on a modified Lorentz profile with an augmented line wing and the latest atmospheric absorption line compilation showed good agreement for all laser lines at high pressures (N700 torr) with some discrepancies at lower pressures. Author (GRA)

N82-21803# Naval Research Lab., Washington, D. C. Radiation Survivability and Detection Branch.
FISSION BETA PARTICLES EMITTED INTO GEOMAGNETOSPHERE Interim Report
W. L. Bendel 23 Dec. 1981 20 p refs
(RR0120141)
(AD-A110228; NRL-MR-4712) Avail: NTIS HC A02/MF A01 CSCL 18/3

The spectrum of electrons emitted into the Earth's magnetic field by an exoatmospheric nuclear burst is considerably more energetic than the spectrum of all delayed electrons from fission, a spectrum often used. A better electron spectrum for general use is presented. Some items are calculated, including a depth-dose curve, for the two spectra compared. Author (GRA)

N82-21804# SRI International Corp., Menlo Park, Calif.
RADAR TRACKING OF BARIUM ION CLOUDS: RESULTS OF THE PLACES EXPERIMENT Final Report, 1 Sep. 1979 - 1 May 1981
Victor H. Gonzalez 1 Aug. 1981 48 p
(Contract DNA001-79-C-0363; SRI Proj. 8780; DNA Proj. 125-AAXH)
(AD-A110295; DNA-5851F) Avail: NTIS HC A03/MF A01 CSCL 04/1

This report describes the results of the Radar tracking of the barium ion clouds during the PLACES series of releases. Ion cloud motion, electron density, altitude and shape are described. Author (GRA)

N82-21805# Systems Science and Software, La Jolla, Calif.
THREE-DIMENSIONAL FINITE DIFFERENCE SIMULATION OF FAULT DYNAMICS: RECTANGULAR FAULTS WITH FIXED RUPTURE VELOCITY
S. M. Day Alexandria, Va. VELA Seismological Center Sep. 1981 51 p refs
(Contract F08606-79-C-0008; ARPA Order 2551)
(AD-A110064; SSS-R-81-5158; VSC-TR-81-28) Avail: NTIS HC A04/MF A01 CSCL 08/7

We analyze three-dimensional finite difference solutions for a simple shear-crack model of faulting to determine the effects of fault length and width on the earthquake slip function. The fault model is dynamic, with only rupture velocity, fault dimensions, and dynamic stress-drop prescribed. The numerical solutions are accurate for frequencies up to 5 Hz, and are combined with asymptotic results for shear cracks in order to characterize the slip function at higher frequencies. Near the hypocenter, the slip velocity exhibits a square root singularity whose intensity increases with hypocentral distance. At distances greater than the fault width, w, growth of the velocity intensity ceases, and the slip function becomes nearly invariant with distance along the fault length. Close-form expressions are developed for the dependence of static slip, slip rise time, and slip velocity intensity on fault geometry. The numerical results imply that uniform-dislocation kinematic earthquake models in which slip is represented by a ramp time-function will under-predict high-frequency ground motion relative to low-frequency ground motion. A further implication of the numerical solutions is that the nature of the in-elastic processes at the advancing edge of a long fault will depend on fault width, but will be independent of rupture length. GRA

N82-21806# Teledyne Geotechnical, Garland, Tex.
SEISMIC SIGNAL DETECTION ALGORITHMS Final Report, 1 Dec. 1979 - 30 Sep. 1981
K. F. Veith 30 Sep. 1981 78 p refs
(Contract F49620-80-C-0031; ARPA Order 3291; AF Proj. 2309)
(AD-A110186; TR-81-12; TR-81-7; AFOSR-81-0887TR; TR-81-8; TR-81-9) Avail: NTIS HC A05/MF A01 CSCL 17/10

This report covers the procedures undertaken and the results obtained during an 18-month program to implement and test an automatic seismic event detection algorithm that is based on the Walsh transform. The algorithm was successfully implemented and tested on a Z80A-based microcomputer, and the system was placed in operation at the Norwegian Seismic Array (NORSAR) for on-line evaluation. The results of the system operation and effectiveness is presented. Also included is a report of the performance of the detection algorithm in off-line tests utilizing standard tapes prepared under AFTAC/VSC supervision. Author (GRA)

N82-21807# Visidyne, Inc., Burlington, Mass.
ATMOSPHERIC INFRARED RADIANCE VARIABILITY Scientific Interim Report
C. H. Humphrey, ed., R. M. Nadile, ed., C. R. Philbrick, ed., and D. R. Smith, ed. Hanscom AFB, Mass. AFGL 27 May 1981 117 p refs
(Contract F19628-79-C-0005; AF Proj. 2310; AF Proj. 6690)
(AD-A109928; AFGL-TR-81-0207; AFGL-ERP-748) Avail: NTIS HC A06/MF A01 CSCL 04/1

Data concerning the spatial and temporal inhomogenities of atmospheric density and composition and their implication concerning the atmospheric infrared radiance are reviewed. Preliminary estimates of the variability in the radiance are presented. In addition, the range of scale sizes from small-scale variations is also considered. GRA

N82-21808# Wyoming Univ., Laramie. Dept. of Physics and Astronomy.
OZONE MEASUREMENTS TO 48Km WITH CHEMILUMINESCENT OZONE DETECTORS Annual Progress Report
J. M. Rosen and D. J. Hofman Jan. 1982 9 p refs
(Contract N00014-76-C-0170)
(AD-A110342; AP-70) Avail: NTIS HC A02/MF A01 CSCL 07/1

An inflight ozone calibrator was tested both in a laboratory environmental chamber and on a balloon flight. The results demonstrate the need for an inflight calibrator and also indicate that there may be a serious and previously unobserved temperature sensitivity problem with one of the primary ozone detectors. Author (GRA)

N82-21809# Ohio State Univ., Columbus. Dept. of Geodetic Science and Surveying.
SIMULATION STUDIES ON THE COMPUTATION OF THE GRAVITY VECTOR IN SPACE FROM SURFACE DATA CONSIDERING THE TOPOGRAPHY OF THE EARTH
Kostas E. Katsambalos Hanscom AFB, Mass. AFGL Jun. 1981 48 p refs
(Contract F19628-79-C-0027; AF Proj. 2309)
(AD-A109856; Rept-314; SCIENTIFIC-8; AFGL-TR-81-0187) Avail: NTIS HC A03/MF A01 CSCL 08/5

Three approaches are investigated for the computation of the components of the gravity vector in space considering the topography of the Earth: a numerical integration approach based on the application of Green's third identity, the Discrete Dirac approach, and the Least-Squares Collocation approach. Under a spherical approximation, the surface of the Earth is assumed to be known through the elevations of its points above a reference sphere. The first technique requires as data gravity disturbances and disturbing potentials on the earth's surface, while the other two techniques require as data surface gravity anomalies. Two point masses located on the axes of symmetry of two simple terrain models (a cone and a sphere), generate on their surfaces the synthetic data needed for the simulations. The agreement between the rigorously computed vetors (from the models), and those from the three techniques, is analyzed in terms of factors such as the inclination of the model's surface, data density, altitude of the space point etc. The application of the Dirac approach is questionable due to its limited accuracy for large data spacing. The Green's approach is recommended for computations above 10 km altitude, while the collocation approach is suitable for computations at points between the Earth's surface and the 10 km level. GRA

N82-21810# Utah Univ., Salt Lake City. Dept. of Geology and Geophysics.
FAULT AND JOINT GEOMETRY AT RAFT RIVER GEOTHERMAL AREA, IDAHO
L. R. Guth, R. L. Bruhn, and S. L. Beck Jul. 1981 23 p refs
(Contract DE-AC07-79ID-12079)
(DE82-003942; DOE/ID-12079-41) Avail: NTIS HC A02/MF A01

Raft River geothermal reservoir is formed by fractures in sedimentary strata of the Miocene and Pliocene salt lake formation. The fracturing is most intense at the base of the salt lake formation, along a decollement that dips eastward at less than 50 on top of metamorphosed precambrian and lower paleozoic rocks. Core taken from less than 200 m above the decollement contains two sets of normal faults. The major set of faults dips between 500 and 700. These faults occur as conjugate pairs that are bisected by vertical extension fractures. The second set of faults dips 100 to 200 and may parallel part of the basal decollement or reflect the presence of listric normal faults in the upper plate. Surface joints form two suborthogonal sets that dip vertically. East-northeast-striking joints are most frequent on the limbs of the Jim Sage anticline, a large fold that is associated with the geothermal field. DOE

N82-21811# Deutsches Geodaetisches Forschungsinstitut, Munich (West Germany).
EARTH TIDAL OBSERVATIONS FROM 1969 TO 1978 AT THE BERCHTESGADEN SALTMINE STATION BY GROUP GROUP 1 OF THE GERMAN GEODETIC RESEARCH INSTITUTE [ERDGEZEITENBEOBACHTUNGEN VON 1969 BIS 1978 IN DER STATION 'SALZBERGWERK BERCHTESGAGEN' DER ABTEILUNG 1 DES DEUTSCHEN GEODAETISCHENFORSCHUNGSINSTITUTS]
Harald Schmitz-Huebsch 1980 51 p refs In GERMAN; ENGLISH summary
(Ser-B-246; ISBN-3-7696-8540-7; ISSN-0065-5317) Avail: NTIS HC A04/MF A01

Following the installation of a vertical pendulum 30 m long for tilt measurements, Earth tidal observations were carried out

with four gravimeters and four tiltmeters from 1969 to 1978. Concerning the gravimeters used, the measuring principle of the permanently swinging pendulum turns out to be < nominally accurate. Other gravimeters give the same results, as demonstrated by 13 further stations in central Europe. Regarding the tiltmeters, the superiority of the principle of the vertical pendulum is clearly shown, since the Earth tidal observations can be carried out on a reference basis of 30 m. Results for this type of pendulum are confirmed with an ASKANIA vertical pendulum. With increasing length in the reference basis, the aperiodic earth tidal movements diminish exponentially. The length of the reference basis of a clinometer evidently has much more influence on the determination of parameters than, e.g., manipulations in the analysis of corrections, as to indirect effects on the computed results. Author (ESA)

N82-21812# Deutsches Geodaetisches Forschungsinstitut, Munich (West Germany).

DETERMINATION OF 12 MINUTE X 20 MINUTE MEAN FREE AIR GRAVITY ANOMALIES FOR THE NORTH SEA REGION

Wolfgang Torge, Georg Weber, and Hans-Georg Wenzel 1980 27 p refs Sponsored by Deutche Forschungsgemeinschaft (Ser-B-247; ISSN-0065-5317; ISBN-3-7696-8541-5) Avail: NTIS HC A03/MF A01

The anomalies were computed for the North Sea region from point free air gravity anomalies and 6 min x 10 min mean free air gravity anomalies. Most of the remaining gaps could be interpolated by least squares prediction filtering. The average rms error of the 12 min x 20 min mean free air gravity anomalies was estimated to + or - 5 mgal. A comparison of the presented gravity anomalies with 1 deg x 1 deg gravity anomalies provided by the U.S. Defense Mapping Agency gave a rms difference of + or - 5 mgal. From the covariance function of 12 min x 20 min mean free air gravity anomalies reduced to the spherical harmonic model GEM10B, anomaly degree variances were computed up to degree 500. Author (ESA)

N82-21813# Deutsches Geodaetisches Forschungsinstitut, Munich (West Germany).

SIMULTANEOUS DETERMINATION OF THE kxi AND eta COMPONENTS OF THE DEVIATION FROM THE VERTICAL BY MEANS OF THE PRISM ASTROLABIUM. PART 11: OBSERVATIONS AT THE FIRST-ORDER TRIANGULATION STATIONS DURING 1976 AT BREUNGESHAIN, BURGHOLDINGHAUSEN, DAMSCHEID, GEROLZHOFEN (WIEBELSBERG), MONTABUR, MUXERATH, NIEDERREIFENBERG, NINDORF, STADE AND TUENSDORF [SIMULTANBESTIMMUNGEN DER LOTABWEITCHUNGS KOMPONENTEN kxi UND eta MIT DEM PRISMENASTROLABIUM. PART 11: BEORACHTUNGEN AUF DEN HAUPTDREIECKSPUNKTEN BREUNGESHAIN, BURGHOLDINGHAUSEN, DAMSCHEID, GEROLZHOFEN (WIELBELSBERG), MONTABAUR, MUXERATH, NIEDERREIFENBERG, NINDORF, STADE UND TUENSDORF IM JAHRE 1976]

Adolf Roedde Frankfurt Verlag des Inst. fuer Angewandte Geodaesie 1980 84 p refs In GERMAN; ENGLISH summary (Ser-B-248-Mitt-157-Pt-11; ISSN-0071-9196) Avail: NTIS HC A05/MF A01

Astronomical determinations of longitudes and latitudes were simultaneously performed on nine first order triangulation stations pertaining to the West German part of the European Triangulation Net. The components kxi and eta of the deviation of the vertical in the system RE 1950 were computed. The observation data and the smoothing results are appended. Author (ESA)

N82-21814# Deutsches Geodaetisches Forschungsinstitut, Munich (West Germany).

LOCAL GEOID DETERMINATION BY MEASUREMENT OF VERTICAL GRAVITY GRADIENTS ON THE EARTH SURFACE Ph.D. Thesis - Karlsruhe Univ., West Germany [ZUR LOKALEN GEOIDBESTIMMUNG AUS TERRESTRISCHEN MESSUNGEN VERTIKALER SCHWEREGRADIENTEN]

Bernhard Heck Verlag der Bayerischen Akademie der Wissenschaften 1979 95 p refs In GERMAN (Ser-C-259; ISSN-0065-5325; ISBN-3-7696-9311-6) Avail: NTIS HC A05/MF A01

The geodetic boundary value probl1 starting from the second derivatives of the disturbing potential in the vertical direction is treated. Recent progress in the precision of the measurement of the vertical gravity gradient opens the prospect of improving the local geoid determination with respect to previous gravity anomaly methods. The numerically most stable solution of the disturbing potential on a spherical surface is obtained by means of a surface distribution. This procedure leads in the case of arbitrary surfaces to an integrodifferential equation whose series solution is given and from which height anomalies, deflection from the vertical, and gravity anomalies are computed. Error analysis shows that height anomaly differences between points up to 50 km apart can be determined with centimeter precision. The high accuracy makes the method particularly well adapted for interpreting local geodynamical effects. Author (ESA)

N82-21815# Deutsches Geodaetisches Forschungsinstitut, Munich (West Germany).

METHODS FOR IMPROVING THE ACCURACY IN PRECISION GRAVIMETRY Ph.D. Thesis - Technischen Hochschule, Darmstadt [METHODEN ZUR GENAUIGKEITSSTEIGERUNG IN DER PRAEZISIONSGRAVIMETRIE]

Bernhard C. Weichel Verlag der Bayerischen Akademie der Wissenschaften 1980 95 p refs In GERMAN (Ser-C-260; ISSN-0065-5325; ISBN-3-7696-9312-4) Avail: NTIS HC A05/MF A01

The achievement of accuracies of a few 10 sub -8 m/sq s by means of a La Coste-Romberg gravimeter is investigated. Such precision allows for ascertaining local temporal changes of gravity differences and for establishing the underlying physical processes. The high precision gravimeter is described, its calibration procedure is explained, and methods to enhance the reading accuracy are given. Appropriate geodetic relevelling is shown to eliminate a large number of unknowns. A least square procedure for solving the gravity differences is developed from which systematic errors can be computed. Measurements on a precision geodetic net show that accuracies of + or - (3 x 10 sub -8 m/sq s) can be achieved. Rain and vertical crustal movements are identified as causes for local and time dependent changes. Author (ESA)

N82-21816# Royal Aircraft Establishment, Farnborough (England). Space Dept.

THE ORBIT OF 1972-05B IN ITS FINAL PHASE, WITH GEOPHYSICAL REFERENCES

H. Hiller London HMSO Sep. 1980 22 p refs (RAE-TR-80119; RAE-Space-587; BR77047) Avail: NTIS HC A02/MF A01

The polar orbit of HEOS 2 second stage rocket, 1972-05B, was determined on each of the final 16 days before its decay in September 1978, using the RAE orbit refinement program, PROP 6, with about 1360 observations. An accuracy of 30-70 m, both radial and across track, was achieved. Eleven values of density scale height were determined from the decrease in perigee height, with a 2% error; seven of these values are within 6% of the CIRA 1972 reference atmosphere values, the rms value being 4% higher than CIRA. The rotation rate of the upper atmosphere lambda was determined from the decrease in orbital inclination as lambda = 1.40 + or - 0.05 revolutions per day; i.e., a strong west-to-east zonal wind of 160 + or - 20 m/sec, at a mean height of about 240 km is shown. The local time was 01-02 hr, solar activity was high, and the latitude of perigee moved steadily from 10 deg N to 67 deg S. Author (ESA)

N82-21817# Defence Research Information Centre, Orpington (England).

THE CHLORINE, BROMINE AND IODINE CYCLES IN THE ATMOSPHERE ABOVE THE OCEAN

J. Rancher Mar. 1981 21 p refs Transl. into ENGLISH from Oceanog. (France), v. 4, no. 3, 1979 p 3-15 (DRIC-T-6313; BR77745) Avail: NTIS HC A02/MF A01

The concentrations of Cl, Br, and I were measured in their particulate and inorganic gas states above the Gulf of Guinea. Aerosols were collected on nuclepore membrane, gaseous inorganic components on Whatman 41 filters impregnated with Li OH solution and the gaseous organic components on a cartridge of active carbon. Nondestructive neutron activation analysis was

used to quantify Cl, Br and I without chemical separation. A reversible reaction between gas and particles in the marine atmosphere was observed in bromine for the first time. The gaseous organic fraction of these three halogens was measured in the eastern Atlantic. It is suggested that the concentrations of the gaseous organic components of these elements are greater than the concentrations of the gaseous inorganic components.
Author (ESA)

N82-21818# Bayerische Akademie der Wissenschaften, Munich (West Germany).
PRECISE GRAVIMETRIC NETWORKS AND RECENT GRAVITY CHANGES IN WESTERN VENEZUELA
Hermann Drewes Verlag der Bayerischen Akademie der Wissenschaften 1980 76 p refs In ENGLISH, GERMAN and SPANISH
(Ser-B-251; ISSN-0065-5317; ISBN-3-7696-8543-1) Avail: NTIS HC A05/MF A01

The fault system along the Cordillera de Merida was examined using gravity stations situated at altitudes varying from 3550 m to 20 m. A long-term trend in gravity decrease at the southern points is indicated. At Lake Maracaibo, subsidence due to petroleum extraction was studied by considering gravity potential. Main gravity variations were recorded at the center of the oilfields.
Author (ESA)

N82-21819 California Univ., San Diego.
SYMMETRY, EXCITATION AND ESTIMATION IN TERRESTRIAL SPCTROSCOPY Ph.D. Thesis
Benjamin Feng Chao 1981 123 p
Avail: Univ. Microfilms Order No. 8129239

Theoretical problems concerning terrestrial spectroscopy or the system of the Earth's normal modes of infinitesimal oscillations were studied by formulating equations of motion in terms of a single, linear 'elastic gravitational' operator. The structure of the terrestrial spectra (particularly the degrees of degeneracy in the spectra) belonging to earth models having different symmetry properties was studied. The influence of perturbations and the selection rules for the perturbation matrices were obtained. The excitation of the normal modes on nonrotating and rotating Earth models were also determined.
Dissert. Abstr.

N82-21820 Minnesota Univ., Minneapolis.
TECTONIC STUDIES OF THE MIDCONTINENT GRAVITY HIGH IN EAST-CENTRAL MINNESOTA AND WESTERN WISCONSIN. PART 1: GRAVITY FIELD AND CRUSTAL STRUCTURE; PART 2: APPLICATION OF PHASE TRANSITION MODELS TO THE PRECAMBRIAN VERTICAL MOTION HISTORY Ph.D. Thesis
Khaled Ali Bagdadi 1981 196 p
Avail: Univ. Microfilms Order No. 8125931

The crustal structure associated with the Midcontinent Gravity High (MCGH) rift system was constrained by two dimensional modeling of five east-west Bouguer gravity profiles. The gravity modeling showed that a satisfactory match with the observed gravity anomalies can be obtained only with a positive density contrast of 0.2 g/cc confined within the upper 20 km of the crust. Results show that low density material in the upper mantle is required to fit the more pronounced gravity low on the eastern flank of the MCGH. Results of phase transition modeling show that a satisfactory fit can be obtained only with a two stage, hot-cold model with the first stage characterized by high values of the surface heat flow and the geothermal gradient and the second stage characterized by lower values for these parameters. This two stage model approximates the cooling history of an igneous intrusion such as the MCGH.
Dissert. Abstr.

N82-21821 California Univ., Berkeley.
TEMPORAL VARIATIONS OF THE ELECTRICAL RESISTIVITY OF THE EARTH'S CRUST Ph.D. Thesis
Ricardo Fernandez 1981 109 p
Avail: Univ. Microfilms Order No. 8200095

Earthquake related resistivity variations along a portion of the San Andreas Fault system, south of Hollister, CA are studied. The temporal variations (i.e. noise) in the apparent resistivity were examined. To improve the measurement accuracy, new instrumentation was developed. Rigorous laboratory and field tests led to further modifications in order to increase reliability and accuracy. A principal result of this study was the identification of the major sources of noise. Large geomagnetically induced telluric currents are responsible for errors during unusual periods of high geomagnetic activity. Preliminary tests using a remote electric field measuring site to cancel the locally induced telluric noise have been conducted. It was learned that for this scheme to be successful in reducing the local error in the measurement, the strength of the inducing geomagnetic field has to be high. A waveform analysis at each monitoring site was conducted in order to evaluate the contribution to error in the averaging procedure by the different electromagnetic responses.
Dissert. Abstr.

N82-21822 Southern Methodist Univ., Dallas, Tex.
GEOPHYSICAL INVESTIGATIONS OF YUCCA FLAT, NEVADA Ph.D. Thesis
John Franklin Ferguson 1981 111 p
Avail: Univ. Microfilms Order No. 8128585

There is an observed variation in body wave magnitude of approximately + or - 0.2 units for explosions in different areas of Yucca Flat, Nevada. The variation appears to correlate with the Cenozoic basin structure at Yucca Flat. It is hypothesized that the variation in m sub b is caused by scattering or resonance effects within the local geological structure. Information from geologic mapping, borehole stratigraphy, and geophysics along with Bouguer gravity measurements were combined to produce a map of the Tertiary-Paleozoic interface beneath the valley. This model was applied to the interpretation of three seismic reflection profiles. These data provide a measure of structural relief and fault distribution within the basin. The structure may be given a coherent geologic interpretation with respect to the tectonics of the western United States during the Cenozoic. The bodywave scattering conjecture was investigated by computation of synthetic teleseismic P-wave amplitude responses for the Yucca Flat geophysical model.
Dissert. Abstr.

N82-21823 California Univ., Berkeley.
CONSTRAINTS ON SEISMIC VELOCITY IN THE EARTH'S MANTLE Ph.D. Thesis
Richard Cacy Lee 1981 77 p
Avail: Univ. Microfilms Order No. 8200176

Extremal bounds on the P and S velocity function in the Earth's mantle were obtained using a large set of bulletin earthquake data. Global earthquake observations were adjusted to conform to a spherical Earth model of radius 6338 km. The travel time data were then reduced to confidence intervals for the mean tau(p) at a high confidence level. An assumption of upper mantle velocity structure was required to construct lower mantle velocity bounds. The principles of the work are: (1) a procedure was developed to judge the suitability of travel time data for reduction to tau(p); and (2) Reliable tau(p) estimates for P and S waves can be obtained from bulletin earthquake observations. This suggests that these measurements can be used directly to constrain Earth models and that comparison of models should be performed in both the tau(p) and v(r) domain.
Dissert. Abstr.

N82-21145*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OZONE AND AIRCRAFT OPERATIONS
Porter J. Perkins *In* NASA. Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Dec. 1981 p 40-44 refs (For primary document see N82-21139 12-01)
Avail: NTIS HC A07/MF A01 CSCL 04A

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N82-21824# Aeronautical Research Labs., Melbourne (Australia).
LOW LEVEL WIND STUDY. BALD HILLS THUNDERSTORM SEASON, 1976-77
C. K. Rider, D. J. Sherman, and M. R. Thomson 1981 509 p refs

(ARL/Struc-Rept-384; AR-002-237) Avail: NTIS HC A22/MF A01

A 200 metre tower was instrumented with anemometers at levels 50 metre apart. Data were recorded each second for about 100 days during the 1976-77 thunderstorm season, although night-time data for the hours midnight to 5 a.m. were generally not recorded. The strongest wind gusts were found to occur during thunderstorm gust front situations. The strongest wind shears occurred in a wider range of meteorological conditions. In order of severity these were: thunderstorm gust fronts; thunderstorms not associated with significant gust fronts; and conditions associated with high temperatures, strong gusty but statistically stationary winds, and active vertical wind components. All the shears obtained using long averaging times (of the order of 10 minutes) were only of slight to moderate intensity. Strong and severe shears occurred fairly frequently but in short bursts, generally little more than 2 minutes in duration. This is a sufficient period to appear as a steady shear to an aircraft pilot during an individual landing, but not long enough to enable measurements made during one landing to be of use during subsequent landings. As an indication of the scattered nature of the high shear incidents, it was found that shears in excess of 0.1/second (i.e. wind speed differences greater than 5 m/s over the lowest 50 metre) occurred for only 0.7 percent of the time, but they occurred for at least 6 seconds n 2.5 percent of the minutes of recorded data, and on more than 90 percent of the days of the experiment. R.J.F.

N82-21825*# Analytical Mechanics Associates, Inc., Hampton, Va.

HORIZONTAL WIND ESTIMATES DETERMINISTICALLY DERIVED FROM THE STS-1 ENTRY FLIGHT DATE--A COMPARISON WITH AVAILABLE METEOROLOGY DATA

G. Mel Kelly and John T. Findlay Jul. 1981 23 p refs (Contract NAS1-16087)

(NASA-CR-165881; NAS 1.26:165881; AMA-81-13) Avail: NTIS HC A02/MF A01 CSCL 04B

Two wind profiles were determined from STS-1 entry flight data based on preliminary best estimate trajectory (BET). The deterministic process used in deriving the atmospheric winds requires inertial estimates of the spacecraft angle-of-attack (alpha) and side-slip angle (beta) from the BET in conjunction with some air data system measurements of the actual angles. The current orbiter air data system (OADS) provides the necessary alpha information. Two beta profiles were adopted. The first profile assumed that the spacecraft would weathervane into any prevailing wind. The second assumed a conservative side-slip history computed from measured accelerations in the spacecraft body axes. It is shown that there are no major differences between the deterministic winds computed using both methods. Further, comparisons of these winds with raw measurements from Tehachapi, California, and preliminary winds obtained from the LaRC LAIRS file and the JSC/TRW descent BET are presented. T.M.

N82-21826*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

CLOUD TOP SCANNING RADIOMETER (CTS): USER'S GUIDE

K. S. Brown Nov. 1981 30 p refs

(NASA-TM-83887; NAS 1.15:83887) Avail: NTIS HC A03/MF A01 CSCL 04B

The CTS maps the Earth's surface with a resolution of 0.1 km from an altitude of 18km with 60km side-to-side coverage of the field. It has three spectral channels. The 0.625 micrometer centered visual channel detects reflectance to within 1 percent. The 6.75 micrometer centered water vapor channel detects changes in temperature of less than one degree Kelvin at 175 K. The 11.5 micrometer centered infrared window channel detects changes of less one half degree Kelvin at 175 K. The data can be converted graphically into three display images of the scene. Values for scene temperature and albedo are calculated from calibration equations. The equations were derived from in-situ and laboratory measurements. Intercomparisons of the flight data temperatures with ground based and other remote sensor results established the certainty of the derived temperature values to within 3 K over a wide temperature range (180 to 320 K). The system performance, calibration, and operation is successful and the engineering information describing this system should prove useful to scientists and potential users of the data. T.M.

N82-21827*# Tennessee Univ. Space Inst., Tullahoma.

THE 1981 CURRENT RESEARCH ON AVIATION WEATHER (BIBLIOGRAPHY) Final Report

Joel Daniel and Walter Frost Washington NASA Mar. 1982 107 p refs

(NASA-CR-3527; M-372; NAS 1.26:3527) Avail: NTIS HC A06/MF A01 CSCL 04B

Current and ongoing research programs related to various areas of aviation meteorology are presented. Literature searches of major abstract publications, were conducted. Research project managers of various government agencies involved in aviation meteorology research provided a list of current research project titles and managers, supporting organizations, performing organizations, the principal investigators, and the objectives. These are tabulated under the headings of advanced meteorological instruments, forecasting, icing, lightning and atmospheric electricity; fog, visibility, and ceilings; low level wind shear, storm hazards/severe storms, turbulence, winds, and ozone and other meteorological parameters. This information was reviewed and assembled into a bibliography providing a current readily useable source of information in the area of aviation meteorology. S.L.

N82-21828*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

COAST-OCEAN-ATMOSPHERE-OCEAN MESOSCALE INTERACTION

David Atlas and Shu-Hsien Chou Feb. 1982 32 p refs

(NASA-TM-83903; NAS 1.15:83903) Avail: NTIS HC A03/MF A01 CSCL 04B

In the case of cold air outbreaks, the combination of the coastal shape and the sea surface temperature (SST) pattern have a profound effect in establishing a low level mesoscale atmospheric circulation as a result of differential heating due to both variations in overwater path length and the SST. A convergence (or divergence) line then forms along a line exactly downwind of the major bend in the coastline. All this is consistent with the structure of the cloud patterns seen in a high resolution Landsat picture of the cloud streets and the major features are simulated well with a boundary layer model. The dominant convergence line is marked by notably larger clouds. To its east the convective roll clouds grow downstream in accord with the deepening of the boundary layer. To its west (i.e., coastal side) where the induced pressure field forces a strong westerly component in the boundary layer, the wind shear across the inversion gives rise to Kelvin-Helmholtz waves and billow clouds whose orientation is perpendicular to the shear vector and to the major convergence line. The induced mesoscale circulation will feedback on the ocean by intensifying the wind generated ocean wave growth and altering their orientation. Coastal cyclogenesis is due in large part not only to the fluxes of heat and moisture from the ocean, but particularly to the differential heating and moistening of the boundary layer air when the air trajectories pass over a well defined pattern of SST. S.L.

N82-21829# Science Applications, Inc., McLean, Va.

NEAR-INERTIAL MOTIONS: A PRELIMINARY MODEL-DATA COMPARISON Technical Report, May - Oct. 1981

David Rubenstein Jan. 1982 36 p refs

(Contracts N00014-81-C-0075; N00014-81-C-0084)

(AD-A109902; SAI-82-620-WA) Avail: NTIS HC A03/MF A01 CSCL 04/2

A summary of a wind-forced dynamical model of near-inertial motions is presented. Results from this model are briefly reviewed. Observations of coherence and response between wind stress and upper ocean currents are compared with model results.GRA

N82-21830# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

TAEGU AB, REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS, A, C-F Final Report

7 Oct. 1981 409 p

(AD-A110245; AD-E850128; USAFETAC/DS-81/095) Avail: NTIS HC A18/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Taegu AB, Korea K-2. It contains the following parts: (A) weather conditions; atmospheric phenomena; (B) precipitation, snowfall and snow depth (daily amounts and extreme values); (C) surface winds; (D) ceiling versus visibility; sky cover; (E) psychrometric summaries (daily maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (F) pressure summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N82-21831# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

BERGSTROM AFB, AUSTIN, TEXAS REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F Final Report

21 Aug. 1981 464 p

(AD-A110243; AD-E850126; USAFETAC/DS-81/088) Avail: NTIS HC A20/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Bergstrom AFB, Austin, Texas. It contains the following parts: (A) weather conditions; atmospheric phenomena; (B) precipitation, snowfall and snow depth (daily amounts and extreme values); (C) surface winds; ((D) ceiling versus visibility; sky cover; (E) psychrometric summaries (daily maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (F) pressure summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N82-21832# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

LUKE AFB, ARIZONA REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F Final Report

18 Sep. 1981 510 p

(AD-A110242; AD-E850125; USAFETAC/DS-81/086) Avail: NTIS HC A22/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Luke AFB, Arizona. It contains the following parts: (A) weather conditions; atmospheric phenomena; (B) precipitation, snowfall and snow depth (daily amounts and extreme values); (C) surface winds; (D) ceiling versus visibility; sky cover; (E) psychrometric summaries (daily maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (F) pressure summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N82-21833# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

MYRTLE BEACH AFB, SOUTH CAROLINA. REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F Final Report

7 Aug. 1981 467 p

(AD-A110241; AD-E850124; USAFETAC/DS-81/080) Avail: NTIS HC A20/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Myrtle Beach AFB, South Carolina. It contains the following parts: (A) weather conditions; atmospheric phenomena; (B) precipitation, snowfall and snow depth (daily amounts and extreme values); (C) surface winds; (D) ceiling versus visibility; sky cover; (E) Psychrometric summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry bulb temperature, means and standard deviations of dry-bulb, wet-bulb and dew point temperatures and relative humidity); and (F) pressure summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N82-21834# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

MCCLELLAN AFB, CALIFORNIA REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F Final Report

1 Jul. 1981 454 p

(AD-A110240; AD-E850123; USAFETAC/DS-81/076) Avail: NTIS HC A20/MF A01 CSCL 04/2

A six part statistical summary of surface weather observations is presented. It contains the following parts: (A) weather conditions; atmospheric phenomena; (B) precipitation, snowfall and snow depth (daily amounts and extreme values); (C) surface winds; (D) ceiling versus visibility; sky cover; (E) psychrometric summaries (daily maxmum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry bulb temperature, means and standard deviations of dry-bulk, wet bulb and dew point temperatures and relative humidity); and (F) pressure summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N82-21835# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

DOVER AFB, DELAWARE REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F Final Report

16 Oct. 1981 472 p

(AD-A110239; AD-E850122; USAFETAC/DS-81/094) Avail: NTIS HC A20/MF A01 CSCL 04/2

Weather conditions, atmospheric phenomena, precipitation, snowfall and snow depth (daily amounts and extreme values), surface winds, ceiling versus visibility, and sky cover are reported. Psychometric summaries (daily maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity) are presented. A pressure summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure) is also included. Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. T.M.

N82-21836# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

ANDREWS AFB, WASHINGTON DC REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F Final Report

15 Oct. 1981 487 p

(AD-A110238; AD-E850121; USAFETAC/DS-81/093) Avail: NTIS HC A21/MF A01 CSCL 04/2

A statistical summary of surface weather observations is reported and contains the: weather conditions; atmospheric phenomena; precipitation, snowfall and snow depth (daily amounts and extreme values); surface winds; ceiling versus visibility; sky cover; psychometric summaries (daily maximum and minimum temperatures, psychrometric summary of web-bulb temperature depression versus dry temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and pressure summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in

most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N82-21837# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

WESTOVER AFB, CHICOPEE FALLS, MASSACHUSETTS REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F Final Report

1 Oct. 1981 484 p

(AD-A110237; AD-E850120; USAFETAC/DS-81/091) Avail: NTIS HC A21/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Westover AFB, Chicopee Falls, Massachusetts. It contains the following parts: (A) weather conditions; atmospheric phenomena; (B) precipitation, snowfall and snow depth (daily amounts and extreme values); (C) surface winds; (D) ceiling versus visibility; sky cover; (E) psychrometric summaries (daily maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (F) pressure summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N82-21838# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

HOWARD AFB, FORT KOBBE, CANAL ZONE, PANAMA REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F Final Report

2 Jul. 1981 405 p ref

(AD-A110038; AD-E850108; USAFETAC/DS-81/075) Avail: NTIS HC A18/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Howard AFB, Fort Kobbe, Canal Zone, Panama. It contains the following parts: (A)weather conditions; atmospheric phenomena; (B) precipitation, snowfall and snow depth (daily amounts and extreme values); (C) surface winds; (D) ceiling versus visibility; sky cover; (E) psychrometric summaries (daily maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (F) pressure summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N82-21839# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

BEALE AFB, MARYSVILLE, CALIFORNIA REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F Final Report

19 Aug. 1981 448 p refs

(AD-A110039; AD-E850109) Avail: NTIS HC A19/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Beale AFB, Marysville, California. It contains the following parts: (A) weather conditions; atmospheric phenomena; (B) precipitation, snowfal and snow depth (daily amounts and extreme values); (C) Surface winds; (D) ceiling versus visibility; sky cover; (E) psychrometric summaries (daily maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (F) pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N82-21840# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

TINKER AFB, OKLAHOMA CITY, OKLAHOMA REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), PARTS A-F Final Report

7 Aug. 1981 482 p refs

(AD-A110040; AD-E850110) Avail: NTIS HC A21/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Tinker AFB, Oklahoma City, Oklahoma. It contains the following parts: (A) weather conditions; atmospheric phenomena; (B) precipitation, snowfall and snow depth (daily amounts and extreme values); (c) surface winds; (D) Ceiling versus visibility; sky cover; (E) psychrometric summaries (daily maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (F) pressure summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N82-21841# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), CANNON AFB, CLOVIS NEW MEXICO, PARTS A-F Final Report

2 Sep. 1981 491 p

(AD-A110041; AD-E850111; USAFETAC/DS-81/083) Avail: NTIS HC A21/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Cannon AFB, Clovis, New Mexico. It contains the following parts: (A) weather conditions; atmospheric phenomena; (B) precipitation, snowfal and snow depth (daily amounts and extreme values); (C) surface winds; (D) ceiling versus visibility; sky cover; (E) psychrometric summaries (daily maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (F) pressure summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N82-21842# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), GEORGE AFB, VICTORVILLE, CALIFORNIA, PARTS A-F Final Report

14 Sep. 1981 518 p

(AD-A110042; AD-E850112; USAFETAC/DS-81/085) Avail: NTIS HC A22/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for George AFB, Victorville, California. It contains the following parts: (A) weather conditions; atmospheric phenomena; (B) precipitation, snowfall and snow depth (daily amounts and extreme values); (C) surface winds; (D) ceiling versus visibility; sky cover; (E) psychrometric summaries (daily maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (F) pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N82-21843# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), COLD LAKE, ALBERTA, CANADA, PARTS A, C-F Final Report

21 Jul. 1981 455 p

(AD-A110043; AD-E850113; USAFETAC/DS-81/078) Avail: NTIS HC A20/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather

observations for Cold Lake, Alberta, Canada. It contains the following parts: (A) weather conditions; atmospheric phenomena; (B) precipitation, snowfall and snow depth (daily amounts and extreme values); (C) surface winds; (D) ceiling versus visibility; sky cover; (E) psychrometric summaries (daily maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (F) pressure summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N82-21844# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO), EGLIN AFB, VALPARAISO, FLORIDA, PARTS A-F Final Report

11 Sep. 1981 459 p

(AD-A110044; AD-E850114; USAFETAC/DS-81/084) Avail: NTIS HC A20/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Eglin AFB, Valparaiso, Florida. It contains the following parts: (A) weather conditions; atmospheric phenomena; (B) precipitation, snowfall and snow depth (daily amounts and extreme values); (C) surface winds; (D) ceiling versus visibility; sky cover; (E) psychrometric summaries (daily maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (F) pressure summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N82-21845# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

ELLINGTON AFB, HOUSTON, TEXAS REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS, (RUSSWO), PARTS A-F Final Report

14 Aug. 1981 451 p

(AD-A110045; AD-E850115; USAFETAC/DS-81/087) Avail: NTIS HC A19/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Ellington AFB, Houston, Texas. It contains the following parts: (A) weather conditions; atmospheric phenomena; (B) precipitation, snowfall and snow depth (daily amounts and extreme values); (C) surface winds; (D) ceiling versus visibility; sky cover; (E) psychrometric summaries (daily maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (F) pressure summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N82-21846# Air Force Systems Command, Wright-Patterson AFB, Ohio.

BREEZES ON THE VOLGA NEAR SARATOV

V. Kellerman 6 Jan. 1982 11 p refs Transl. into ENGLISH from Meteorol. i Gidrologikila: Nauchno-teknicheskifi z. (USSR), v. 2, no. 9, 1936 p 63-66

(AD-A110261; FTD-ID(RS)T-1611-81) Avail: NTIS HC A02/MF A01 CSCL 04/2

Breeze winds off the Volga River in the U.S.S.R. were studied. Wind speed and direction were measured during the period from 1912 to 1921. The winds possessed a clearly defined diurnal periodicity with respect to direction. A bifuraction of flow was caused by the Volga riverbed. R.J.F.

N82-21847# National Maritime Inst., Teddington (England). Wind Engineering Services.

REQUIREMENTS FOR THE PROVISION OF OFFSHORE WIND DATA RELATING TO WIND ENERGY CONVERSION SYSTEMS

R. I. Harris Feb. 1980 30 p refs

(NMI-R-75) Avail: NTIS HC A03/MF A01

The requirements for environmental data relating to offshore wind energy conversion systems in the United Kingdom to provide a basis for analysis of wind climate and wind structure in offshore wind energy systems are discussed. A review of available data, a measurement program to study offshore wind structure, and an analysis of the sensitivity of the system to wind parameters are proposed. A detailed measurement program at potential sites, a study of the changes and rates of change of wind structure from land to sea, and a feasibility study of an alternative and potentially cheap operational wind energy prediction method are also included. Author (ESA)

N82-21848# National Maritime Inst., Teddington (England).

THE MEASUREMENT OF WIND STRUCTURE AT WEST SOLE

J. A. B. Wills Jun. 1980 38 p ref Sponsored in part by DOE

(NMI-R-79; OT-R-8039) Avail: NTIS HC A03/MF A01

The anemometers and related instruments for measuring wind velocity profile and turbulence at the West Sole A platform in the southern North Sea are described. The measurement array consists of 14 anemometers at 7 heights between 9 m and 83 m, 2 wind vanes, 2 temperature sensors and a wave gage. Sampling is continuous with anemometer data processed to give the 3 min mean and rms values, and maximum 3 sec gust. A Hewlett-Packard 6940 B multiprogrammer and 9825 A computer are used for data acquisition and processing. A Tandberg TDC dual drive tape recorder records the binary data with each 8 bit byte representing a data value to an accuracy of 0.4%. Some eight sets of fast data were recorded, each providing 50,000 samples of velocity for medium to high wind speeds. The analysis of these data is under way to provide a series of gust histories and correlations, and spectra at various heights, and correlations between sea surface fluctuations and wind speeds. Author (ESA)

N82-21849# National Maritime Inst., Teddington (England).

HOT-WIRE AND HOT FILM ANEMOMETRY

J. A. B. Wills May 1980 67 p refs Presented at a series of lectures given at Stanford, Calif., Jun. and Aug. 1979

(NMI-R-82) Avail: NTIS HC A04/MF A01

Theory, development, and practice of hot wire and hot-film anemometry are introduced. Response equations and corrections to the basic response are explained. Circuitry is analyzed. Hardware, calibration, and limitations of simple probes are discussed. Special probes, including temperature, wedge, and submerging probes are described. Author (ESA)

N82-21850# National Maritime Inst., Teddington (England).

WAVE CLIMATE SYNTHESIS FOR ENGINEERING PURPOSES

N. Hogben Apr. 1981 42 p refs Presented at Soc. of Underwater Technol. Meeting, London, 17 May 1979 Sponsored by Ship and Marine Technology Requirements Board and Dept. of Energy Prepared in cooperation with Society for Underwater Technology, London

(NMI-R-103; SMT-M-8101) Avail: NTIS HC A03/MF A01

Methods for deriving wave statistics from wind statistics are treated. The primary sources of data are reviewed and the methods for analyzing them to meet engineering requirements are presented: (1) for the prediction of wave height statistics directly from wind statistics without recourse to time history analysis; and (2) for the use of simple wave and wind statistics to synthesize more sophisticated models of wave climate expressed in terms of spectra. These can provide a detailed statistical description, amenable to engineering analysis, of the wave conditions throughout the life of a structure. Author (ESA)

N82-21851# National Oceanic and Atmospheric Administration, Washington, D. C. Federal Coordinator for Meteorological Services and Supporting Research.

NATIONAL SEVERE LOCAL STORMS OPERATIONS PLAN
Feb. 1981 50 p
(PB82-130055; FCM-P11-1981; NOAA-81022605) Avail: NTIS HC A03/MF A01 CSCL 04B

The fourteenth in a series of annual National Severe Local Storm Operations Plans developed in response to a 1967 request by the Federal Coordinator for Meteorological Services and Supporting Research is presented. The plan outlines responsibilities of the various United States agencies which provide meteorological services in observing the forecasting of severe local storms. The plan supersedes the 1980 version and incorporates changes recommended by the concerned agencies on Severe Local Storms. GRA

N82-21852# National Academy of Sciences - National Research Council, Washington, D. C. Committee on Atmospheric Sciences.
CURRENT MESOSCALE METEOROLOGICAL RESEARCH IN THE UNITED STATES Final Report
Nov. 1981 41 p Sponsored in part by NOAA
(Grant NSF ATM-80-24257)
(PB82-137126) Avail: NTIS HC A03/MF A01 CSCL 04B

The current status of mesoscale meteorological research in the United States is summarized. It is recommended that a National Mesoscale Program be established in order to focus and enhance research into the mesoscale aspects of extratropical cyclones and severe local storms. The principal practical goals of this research would be significant improvements in short-range weather forecasts of precipitation and the occurrence of severe weather including hurricanes, thunderstorms, and tornadoes. GRA

N82-21853# National Advisory Committee on Oceans and Atmosphere, Washington, D.C.
A REVIEW OF ATMOSPHERIC SCIENCE RESEARCH FACILITIES
Victoria J. Jones Jun. 1981 37 p refs
(PB82-118936; NACOA-20) Avail: NTIS HC A03/MF A01 CSCL 04B

The National Advisory Committee on Oceans and Atmosphere (NACOA) examined three major classes of observational facilities that are needed to improve the quality and effectiveness of the Nation's meteorological research and service functions. The classes are: remote sensing equipment, instrumented airplanes, and computers. GRA

N82-21147*# Naval Research Lab., Washington, D. C.
PROGRESS ON LOW ALTITUDE CLOUD ICING RESEARCH
Richard K. Jeck *In* NASA. Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Dec. 1981 p 59-63 refs Prepared in cooperation with Naval Academy (For primary document see N82-21139 12-01)
Avail: NTIS HC A07/MF A01 CSCL 04B

N82-21150*# Federal Aviation Administration, Washington, D.C.
PROTOTYPE REGIONAL OBSERVATION AND FORECAST SYSTEM (PROFS)
John W. Hinkelman, Jr. *In* NASA. Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Dec. 1981 p 81-85 (For primary document see N82-21139 12-01)
Avail: NTIS HC A07/MF A01 CSCL 04B

N82-21152*# National Center for Atmospheric Research, Boulder, Colo.
THE JOINT AIRPORT WEATHER STUDIES PROJECT
John McCarthy *In* NASA. Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Dec. 1981 p 91-95 (For primary document see N82-21139 12-01)
Avail: NTIS HC A07/MF A01 CSCL 04B

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N82-21854# Materials Research Labs., Melbourne (Australia).
THE DEEP OCEAN SOUND CHANNEL IN AREAS AROUND AUSTRALIA
Daniel J. Whelan Oct. 1980 34 p refs
(MRL-R-788; AR-002-368) Avail: NTIS HC A03/MF A01

The physicochemical data collected in the Southern Indian Ocean, Coral Sea, and around Tasmania were used to determine the acoustical properties predicted for the deep ocean sound channel (SOFAR axis) in these bodies of water. Water samples were taken and subsequently analyzed for variations with depth of temperature, salinity, pH and alkalinity, dissolved oxygen, metal ion concentrations, etc. From the data accumulated, various calculations can be made on the expected dynamics properties of the ocean mass including profiles of the velocity of sound, its absorption and transmission in sea water, water transport and circulation, and the stratification of waters within the ocean. S.L.

N82-21855# Materials Research Labs., Melbourne (Australia).
A STATISTICAL EVALUATION OF SOME PHYSICAL AND CHEMICAL CHARACTERISTICS OF OCEAN WATER AT 2 STATIONS OFF THE EAST AUSTRALIAN COAST
J. H. Bishop, A. deForest, R. W. Pettis, A. T. Phillip, and P. D. Watt Sep. 1980 36 p refs
(MRL-R-796) Avail: NTIS HC A03/MF A01

Salinity, pH, dissolved oxygen, temperature, Mg, Cd, Cu, Pb and Zn deg were measured at depths down to 3600 meters at two stations located at latitude 31 deg 58' S, longitude 154 deg 02'E and latitude 30 deg 20'S, longitude 154 deg 40'E. The heavy metal concentrations (Cd < 0.2 mu gl(-1); Cu 0.4 to 4.8 mu gl(-1); Pb 0.2 to 1.9 mu gl(-1); Zn 0.4 to 7.6 mu gl(-1)) were typical of open ocean waters. The observed variations were within the experimental error of the anodic stripping voltammetry method used, except in the surface waters of the second station where a significant variation in copper concentration, which correlated with a variation in lead concentration, was observed in conjunction with a more variable pH. These variations were tentatively attributed to the possible presence of a larger, or more variably distributed, biomass. Mg/Cl ratios, derived from atomic absorption spectroscopic measurements, varied from 0.0643 to 0.0659. A number of correlations were found at both stations between depth, salinity, temperature pH, dissolved oxygen saturation and magnesium. These correlations demonstrated the feasibility of predicting chemical conditions at a given location and depth more closely than is currently possible. Significant differences between near surface waters at the two stations in some of these relationships showed that it would be necessary to take the presence of hydrological features, such as thermal eddies, into account when making such predictions.
R.J.F.

N82-21856# Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
THE COASTAL ENVIRONMENTAL REFERENCE SERVICE, RETRIEVAL PROGRAM USERS GUIDE Final Report
Richard B. Blumenthal and Bobby OQuinn Oct. 1981 28 p
(Contract N00014-75-C-0408)
(AD-A110158; NOO-RP-35) Avail: NTIS HC A03/MF A01 CSCL 09/2

Detailed instructions are presented for the retrieval of information from the Coastal Environmental Reference Service data base via the use of an interactive retrieval program. The data base contains information on coastal studies, data collection sites and the types of data collected, and geophysical models on coastal processes. Information obtainable includes location, dates, parameters taken, methods of collection, points of contact for data retrieval, published articles, and brief explanatory remarks. There is also an analog feature which permits retrieval of data source records for areas which are environmentally similar to a series of user provided parameter specifications.
Author (GRA)

N82-21857# Lamont-Doherty Geological Observatory, Palisades, N. Y.
GEOPHYSICAL DATA FROM DRIFTING ICE STATION FRAM 3
Kenneth Hunkins, T. O. Manley, Werner Tiemann, and Ruth Jackson Dec. 1981 115 p refs
(Contract N00014-76-C-0004)
(AD-A109987; LDGO-CU-3-81; TR-3) Avail: NTIS HC A06/MF A01 CSCL 08/1

A scientific research camp was established on a drifting ice floe north of Spitsbergen on March 14, 1981, and occupied until May 13, 1981, while the floe drifted 361 km southwestward. Position of the camp was monitored with a satellite navigation system. Ocean depth was sounded continuously during the drift as the camp crossed from the Farm Basin onto the Yermak Plateau. Rotation of the ice floe, magnetic declination and gravity were all measured frequently. Sub-bottom geological horizons were profiled with an air-gun and seismic reflection system. Data from all of these measurements are presented in the form of tables and profiles. GRA

N82-21858# Delaware Univ., Newark. Dept. of Civil Engineering.
DYNAMICS OF COASTAL CONDITIONS Final Report, 1 Sep. 1976 - 31 Aug. 1980
Hsiang Wang and Robert A. Dalrymple Dec. 1981 14 p refs
(Contract N00014-76-C-0342)
(AD-A109463; TR-9) Avail: NTIS HC A02/MF A01 CSCL 08/3

This report summarizes the accomplishments of the research project 'Dynamics of Coastal Conditions'. The research objectives were oriented toward developing predictive tools tailored to the Navy's needs. Specifically, the efforts were concentrated in three major tasks aimed at predicting coastal conditions: (1) developing a nearshore circulation model; (2) developing an onshore-offshore sediment transport model, and (3) Developing a shallow water wave transformation model. During the course of research, various research tools including numerical modeling, laboratory studies and in-situ and remote-sensing field observations were employed. GRA

N82-21859# Florida State Univ., Tallahassee. Dept. of Oceanography.
VARIABILITY OF THE ANTICYCLONIC CIRCULATION IN THE WESTERN GULF OF MEXICO Progress Report
Richard D. Kassler and Wilton Sturges Sep. 1981 80 p refs
(Contract N00014-75-C-0201; NR Proj. 083-231)
(AD-A109605; Rept-189) Avail: NTIS HC A05/MF A01 CSCL 08/3

The anticyclonic circulation in the western Gulf of Mexico is studied through 6 AXBT flights, 5 cruises, and moored current meter data over the course of a year, as well as through examination of the historical data base. It is concluded that the flow field consists of: a background circulation presumably forced by the curl of the wind stress; and the presence of warm core rings which periodically pinch off from the Loop Current.
Author (GRA)

N82-21860# Florida State Univ., Tallahassee. Dept. of Oceanography.
AN ANALYSIS OF HYDROGRAPHIC DATA FROM KNORR CRUISE 83 IN HEBBLE AREA, SEPTEMBER - OCTOBER, 1980
Georges L. Weatherly, Edward A. Kelley, and Reinard Harkema Oct. 1981 53 p refs
(Contract N00014-75-C-0201)
(AD-A109623; Rept-188) Avail: NTIS HC A04/MF A01 CSCL 08/1

We present in figure form some of the hydrographic data collected on the Scotian Rise in September - October, 1980 as part of the HEBBLE program. Two full water column theta and S cross slope transects are presented together with two sigma sub 5 transects for comparison. Selected surface to bottom computed geostrophic velocity profiles are also presented. To focus further on conditions near the ocean bottom, two near bottom, cross slope theta and transmissibity transects are shown. Additionally, in the lowest 350 m for each station, there is shown a plot of theta, salinity, sigma sub 5, and transmissivity (where available). Author (GRA)

N82-21861# National Maritime Inst., Teddington (England).
ROOT-MEAN-SQUARE FORCE COEFFICIENTS DERIVED FROM CHRISTCHURCH BAY WAVE FORCE DATA
J. R. Bishop Jul. 1979 20 p refs Presented at IAHR Symp. on Mech. of Wave-Induced Forces on Cylinders, Bristol, England, Sep. 1978 Sponsored by Dept. of Energy's Offshore Energy Technology Board
(NMI-R-62; OT-R-7943) Avail: NTIS HC A02/MF A01

Measured wave force data from the Christchurch Bay tower were analyzed by a technique in which the data are fitted to an equation relating mean square force to particle motion parameters. The total data are divided into small samples for the derivation of the mean square parameters. The sample duration was varied to study its effect on the force coefficients. The sampling interval varied between 20s and 240s. The smallest values of the interval give the largest variability of the coefficients, but no attempt was made to allocate the increasing variability to the causes which are discussed. Values of the force mean square were obtained for the main column which is in the inertia regime and for the smaller force sleeves on the staff which has about equal drag and inertia force amplitudes. Mean square values show strong similarities through a 20 minute period in a storm, when comparing results at various integration intervals.
Author (ESA)

N82-21862# National Maritime Inst., Teddington (England).
A NEW COEFFICIENT FOR TOTAL WAVE FORCE
J. R. Bishop Oct. 1980 32 p refs Sponsored by Dept. of Energy's Offshore Energy Technology Board
(NMI-R-77; OT-R-8017) Avail: NTIS HC A03/MF A01

A total force coefficient is defined which nondimensionalizes wave force by both the particle velocity and acceleration. Existing total force coefficients nondimensionalize by velocity only and have disadvantages when working in the inertia or inertia/drag force regimes. This coefficient is being used in the analysis of wave force data from the Christchurch Bay tower. Author (ESA)

N82-21863# National Maritime Inst., Teddington (England).
THE UNITED KINGDOM CHRISTCHURCH BAY PROJECT: A REVIEW OF RESULTS
J. R. Bishop, R. G. Tickell (Liverpool Univ., England), and K. A. Gallagher (Building Research Estab.) Jun. 1980 17 p refs Presented at 12th Ann. Offshore Technol. Conf., Houston, 5-8 May 1980 Sponsored by DOE
(NMI-R-87; OT-M-8003) Avail: NTIS HC A02/MF A01

An instrumented 20 m tower was installed to study wave forces on vertical cylinders at a large scale and in real sea conditions, and the behavior of a gravity foundation. The wave forces are analyzed by wave by wave, mean square, statistical and spectral methods. Force coefficients are dependent on the Keulegan-Carpenter number and also on the tidal current. Key measurements include the fluid particle velocity and acceleration, which are obtained from perforated ball instruments. The particle velocities in depth limited waves are overpredicted by shallow water wave theories. The tower has a concrete gravity base sited on fine sand overlying clay. Foundation failures occurred leading to rocking, tilt and sink. Erosion due to the pumping of water by the rocking action led to progressive deterioration of the foundation. The tower now has a larger base and has been resited. Author (ESA)

N82-21864# National Maritime Inst., Teddington (England).
THE CHRISTCHURCH BAY TOWER: ITS ROLE IN WAVE FORCE PREDICTIONS
J. R. Bishop Sep. 1980 14 p refs Presented at Joint Inst. of Struct. Engr./Building Res. Estab. Seminar on the Use of Phys. Models in the Design of Offshore Struct., Watford, England, 15-16 Nov. 1979 Sponsored by DOE
(NMI-R-88; OT-M-8004) Avail: NTIS HC A02/MF A01

A bay tower designed to provide data on critical elements of wave force prediction methods, such as force coefficients, and to determine the validity of the complete prediction method is discussed. Data under real sea conditions and on a suitably large scale are acquired. The linear relationship between force and wave height, and the influences of votices and currents are

investigated. Theoretical assumptions for velocity spectra and force coefficients are supported. Author (ESA)

N82-21865# Materials Research Labs., Melbourne (Australia).
OCEANOGRAPHIC OBSERVATIONS IN THE INDIAN OCEAN, MARCH 1978: A CHEMICAL SURVEY BY MARINE ENVIRONMENT GROUP
Russell W. Pettis and Daniel J. Whelan Sep. 1980 30 p refs
(MRL-R-792) Avail: NTIS HC A03/MF A01

Chemical and physicochemical data on water samples taken at depths down to 4000 meters from eleven stations in the South-East Indian Ocean were compiled. Samples from each station were analyzed for variations with depth of temperature, salinity, pH and alkalinity, dissolved oxygen, metal ions and nutrients. From this material, comments were made about certain parameters in sea water which may have long term operational significance, viz. sound speed at various depths, the location of the deep ocean sound channel axis, the absorption of sound in sea water and the nature of the chemical environment at these stations. R.J.F.

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N82-21866*# National Aeronautics and Space Administration, Washington, D. C.
ROLE OF IMMOBILIZATION OF IRRADIATED RATS IN THE PROTECTIVE EFFECT OF BONE MARROW SHIELDING
N. F. Gronskaya and G. S. Strelin Feb. 1982 7 p refs Transl. into ENGLISH from Radiobiologiya (Leningrad), v. 20, no. 2, 1980 p 259-262 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by Central Sci. Res. X-ray Radiological Inst. of the USSR Ministry of Public Health
(Contract NASw-3542)
(NASA-TM-76828; NAS 1.15:76828) Avail: NTIS HC A02/MF A01 CSCL 06C

Rats were exposed to X-radiation to study the influence of immobilization and shielding of part of bone marrow during exposure on survival. It is concluded that (1) the beneficial effect of the stress factor (created by the immobilization of rats during exposure) can aggregate with the effect of bone marrow shielding and, under certain conditions, imitate the latter; and (2) the probability of the protective effect of immobilization should be taken into account when assessing the influence of bone marrow shielding. Author

N82-21867*# National Aeronautics and Space Administration, Washington, D. C. Inst. for Morphology.
MORPHOMETRICAL INVESTIGATIONS ON THE REPRODUCTIVE ACTIVITY OF THE OVARIES IN RATS SUBJECTED TO IMMOBILIZATION AND TO MOTION ACTIVITY
N. Konstantinov, L. Cheresharov, and S. Toshkova Mar. 1982 15 p refs Transl. into ENGLISH from Veterinarnomeditsinski Nauki (Sofia), v. 16, no. 6, 1979 p 66-74 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Bulgarian Academy of Sci., Sofia
(Contract NASw-3541)
(NASA-TM-76831; NAS 1.15:76831) Avail: NTIS HC A02/MF A01 CSCL 06C

Wistar-strain white female rats were divided into three groups, with the first group subjected to motion loading, the second used as control, and the third group was immobilized. A considerable reduction in numbers of corpora lutea was observed in the immobilized group, together with smaller numbers of embryos, high percent of embryo mortality, fetal growth retardation, and endometrium disorders. The control group showed no deviation from normal conditions, and there was slight improvement in reproductive activity of animals under motion loading. B.W.

N82-21868*# Alabama Univ. in Birmingham. Div. of Molecular Biology.
THE CHEMICAL BASIS FOR THE ORIGIN OF THE GENETIC CODE AND THE PROCESS OF PROTEIN SYNTHESIS Semiannual Report
22 Dec. 1981 19 p refs
(Grant NGR-01-010-001)
(NASA-CR-168748; NAS 1.26:168748) Avail: NTIS HC A02/MF A01 CSCL 06C

The principles upon which the process of protein synthesis and the genetic code were established are elucidated. Extensive work on nuclear magnetic resonance studies of both monomer-monomer and monoamino acid polynucleotide interactions is included. A new method of general utility for studying any amino acid interacting with any polynucleotide was developed. This system involves the use of methyl esters of amino acids interacting with polynucleotides. N.W.

N82-21869*# Oklahoma State Univ., Stillwater. Dept. of Microbiology.
MICROBIAL ECOLOGY OF EXTREME ENVIRONMENTS: ANTARCTIC DRY VALLEY YEASTS AND GROWTH IN SUBSTRATE LIMITED HABITATS Progress Report, 1 Dec. 1980 - 30 Nov. 1981
Helen S. Vishniac 30 Nov. 1981 27 p refs
(Grant NAGw-26)
(NASA-CR-168742; NAS 1.26:168742) Avail: NTIS HC A03/MF A01 CSCL 06C

The multiple stresses temperature, moisture, and for chemoheterotrophs, sources of carbon and energy of the Dry Valley Anarctica soils allow at best depauperate communities, low in species diversity and population density. The nature of community structure, the operation of biogeochemical cycles, the evolution and mechanisms of adaptation to this habitat are of interest in informing speculations upon life on other planets as well as in modeling the limits of gene life. Yeasts of the Cryptococcus vishniacil complex (Basidiobiastomycetes) are investigated, as the only known indigenes of the most hostile, lichen free, parts of the Dry Valleys. Methods were developed for isolating these yeasts (methods which do not exclude the recovery of other microbiota). The definition of the complex was refined and the importance of nitrogen sources was established as well as substrate competition in fitness to the Dry Valley habitats. S.L.

N82-21870# Materials Research Labs., Melbourne (Australia).
SETTLEMENT OF FOULING ORGANISMS AT THE JITTRE NORTH BARNARD ISLAND RAFT SITE
John A. Lewis Apr. 1981 13 p refs
(MRL-TN-450) Avail: NTIS HC A02/MF A01

Data on the settlement of the major fouling organisms below the marine exposure raft at the North Barnard Islands, Queensland, are presentd for a twelve month period. Organisms settled throughout the year. The red algal species Heteroderma sp. and Laurencia obtusa were the dominant organisms when assessed as number of individuals per unit area. However, the most abundant organisms were the brown alga Feldmannia indica, the hydroid Campanularia delicatula and the stoloniferous bryozoan Aetea truncata. In all, seventy-one taxa from ten phyla settled during the study period. On the basis of fouling settlement, the raft is considered a suitable site to test the resistance of coatings to fouling growth under tropical conditions. R.J.F.

N82-21871# Materials Research Labs., Melbourne (Australia).
SETTLEMENT OF FOULING ORGANISMS AT THE HMAS STIRLING RAFT SITE
John A. Lewis Nov. 1980 13 p refs
(MRL-TN-441) Avail: NTIS HC A02/MF A01

The settlement of fouling organisms on non-toxic panels was studied over a twelve-month period on a marine exposure raft at HMAS STIRLING in Cockburn Sound, western Australia. Monthly settlement counts for the six major organisms and water temperature measurements indicated that the raft met the criteria of Australian Standard 1580, test method 481.5 in these respects, as required for registration by the National Association of Testing Authorities. Larval settlement occurred throughout the year and water temperatures are within the range prescribed by the standard. Species which settled on the panels represented each of the major groups of fouling organisms. Panels immersed for twelve months were initially dominated by algae but these were subsequently displaced by barnacles, ascidians and bivalve molluscs. R.J.F.

N82-21872# Materials Research Labs., Melbourne (Australia).
THE EFFECTS OF UNDERWATER EXPLOSIONS ON MARINE LIFE IN SHOALWATER BAY, QUEENSLAND
I. C. Dunstan and J. A. Lewis Sep. 1980 32 p refs
(MRL-R-795) Avail: NTIS HC A03/MF A01

Data on the effects of underwater explosions on marine life are presented. This was done in order to assess the ecological and biological impact on marine communities of underwater explosions in Shoalwater Bay, Queensland. A general assessment of the possible effects of the explosions is given on the basis of overseas data relevant to the biological effects of underwater explosions, and from the limited data published on the marine communities of the Queensland coast. R.J.F.

N82-21873# Georgia Inst. of Tech., Atlanta. Biomedical Research Branch.
INVESTIGATION OF RADIOFREQUENCY RADIATION EFFECTS ON EXCITABLE TISSUES Final Technical Report
R. L. Seaman, E. C. Burdette, and R. L. DeHaan (Emory Univ.) 31 Jul. 1981 100 p refs
(Contract F39620-79-C-0055; AF Proj. 2312)
(AD-A109813; AFOSR-82-0020TR) Avail: NTIS HC A05/MF A01 CSCL 06/18

Spheroidal aggregates of cultured chick cardiac cells were used to study effects of 2450-MHz radiofrequency radiation (RFR) on excitable membranes. Rhythmically beating aggregates under normal culture conditions were exposed to known amounts of RFR energy in a specially developed open-ended coaxial device. Exposure level was given in terms of Specific Absorption Rate (SAR) in mW/g. Short-term recordings with intracellular electrodes suggested that increased variability in beat rate and in action potential maximum upstroke velocity occurred in the range of 10-40 mW/g for continuous wave (CW) RFR and RFR modulated as 10.9-microsecond pulses at 10,000 pps (PW). Long-term recordings with extracellular electrodes and video imaging were used to gather interbeat interval (IBI) data for computing mean IBI and coefficient of variation (CV). Three-minute exposures to CW and PW RFR and to RFR square-wave modulated at 1.6 or 16 Hz were made for SARs between 1.2 and 85.5 mW/g. Decreases in mean IBI during exposure for SARs greater than 30 mW/g closely matched those expected from induced temperature rises. However, IBI changes at smaller SARs, including an increase at 1.2 mW/g, were not fully explained by temperature changes. Small changes in CV occurred during exposure and were similar to those during sham exposures.GRA

N82-21874# Smithsonian Institution, Washington, D. C. Radiation Biology Lab.
PRIMARY LIGHT-HARVESTING SYSTEM: PHYCOBILISOMES AND ASSOCIATED MEMBRANES Progress Report, 1 Jan. - 31 Dec. 1981
E. Gantt 1981 5 p refs
(Contract DE-AS05-76ER-04310)
(DE81-028326; DOE/ER-04310/22) Avail: NTIS HC A02/MF A01

Phycobilisomes, serving as primary light harvesting complexes in cyanobacteria and red algae, were investigated. Allophycocyanin is in the center near the thylakoid. Stacked rods composed of phycocyanin, or phycocyanin phycoerythrin radiate peripherally from the allophycocyanin core. Phycobilisomes of Nostoc sp. and Fremyella displosiphon, after separation into separate allophycocyanin and phycoerythrin phycocyanin fractions were associated in vitro. Hybrid phycobilisomes, derived from mixtures of phycobiliprotein from these species were also obtained. Phycobilisomes were similar in their sedimentation, absorption, fluorescence excitation, fluorescence emission, and by electron microscopy. Many of the colorless polypeptides were also highly similar between Nostoc and Fremyella. The polypeptide composition of Porphyridium cruentum phycobilisomes is the most complex of any thus far examined. The phycobiliprotein containing polypeptides comprised 84% of the total stainable protein, while the remaining were colorless. Most of the colorless polypeptides occurred in a pelletable fraction, which was enriched in allophycocyanin and phycocyanin. DOE

N82-21875# Beth Israel Hospital, Boston, Mass. Div. of Nuclear Medicine.
MOLECULAR EVENTS BASIC TO CELLULAR RADIATION RESPONSE Progress Report, 1 Oct. 1980 - 31 Dec. 1981
G. M. Kolodny 1981 21 p refs
(Contract DE-AC02-80EV-10327)
(DE81-029813; DOE/EV-10327/T1) Avail: NTIS HC A02/MF A01

Research during the past year was directed at induction of specific protein synthesis in differentiated mammalian cells. The Primer Hypothesis for the regulation of eukaryotic gene expression suggests that RNA transcription is primed by small molecular weight RNA. It predicts that albumin mRNA transcription in a 3T3 fibroblast, which ordinarily does not produce albumin, can be initiated by RNA primer present in liver cells. During this past year experiments in which mouse fibroblasts were incubated with mouse liver RNA in the presence of polylysine were continued. Although these cells did indeed produce albumin which was detected by counterimmunoelectrophoresis the results were not consistent but depended on as yet unknown conditions of the extracted RNA. Conditions of phenol preparation extraction of RNA and incubation of RNA and cells were carefully monitored. None of these variations in technique were successful in reproducibly stimulating albumin synthesis on a repetitive basis although intermittently positive results were obtained. Because of these inconsistent results other methods of introducing RNA into cells were considered. DOE

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N82-21876* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY. A CONTINUING BIBLIOGRAPHY WITH INDEXES
Mar. 1982 81 p
(NASA-SP-7011(230); NAS 1.21:7011) Avail: NTIS HC $7.00 CSCL 06E

This bibliography lists 244 reports, articles, and other documents introduced into the NASA scientific and technical information system in February 1981. Aerospace medicine and aerobiology topics are included. Listings for physiological factors, astronaut performance, control theory, artificial intelligence, and cybernetics are included. R.J.F.

N82-21877# Materials Research Labs., Melbourne (Australia).
A COMPARISON OF THE ANTIMUSCARINIC PROPERTIES OF APROPHEN WITH THOSE OF SOME OTHER ANTICHOLINERGIC DRUGS
R. M. Dawson, S. E. Freeman, and B. M. Paddle Sep. 1980 11 p refs
(MRL-R-794) Avail: NTIS HC A02/MF A01

Apparent dissociation constants K sub i for the interaction of benactyzine, aprophen, and atropine with the muscarinic cholinoceptor were determined in the brain (striatum and pons-medulla) and ileum of the guinea pig by competition with (3H)- quinuclidinyl benzilate (QNB) in a direct binding assay. Corresponding dissociation constants in the atrium were determined by antagonism of antagonism of acetylcholine-induced contractions. In all regions studied, aprophen and benactyzine (which are closely related structurally) were approximately equi-effective, based on their K sub i values, and about 1/4 as effective as atropine. Hyoscine and the glycollate T3436 were also studied in the atrium and found to be more potent muscarinic antagonists than atropine. Values of K sub i were in the nanomolar range. For any one antagonist, significant differences were observed between K sub i values for different regions. Author

N82-21878# Materials Research Labs., Melbourne (Australia).
AN EXAMINATION OF THE FEASIBILITY OF ADMINISTERING PROPHYLACTIC PYRIDOSTIGMINE BY THE PERCUTANEOUS ROUTE
Hugh D. Crone and Michael P. Bladen 1981 16 p refs
(MRL-TN-449) Avail: NTIS HC A02/MF A01

The feasibility of administering pyridostigmine by the percutaneous route was examined by the use of guinea pigs in vivo and their skin in vitro. Pyridostigmine has a possible use

as a prophylactic against inhibit blood cholinesterase, producing effects observable in 30 minutes. Evidence of the storage of pyridostigmine in skin was found. The compound when crossing skin in vitro takes 1,000 minutes to reach an equilibrium rate. A permeability constant was estimated. The main problem remaining is the practical on of making a dosage form suitable for presenting the pyridostigmine at constant concentration to the skin for a long period. Author

N82-21879# Air Force Systems Command, Wright-Patterson AFB, Ohio. Biodynamics and Bioengineering Div.
F/FB-111 EJECTION EXPERIENCE (1967-1980). PART 1: EVALUATION AND RECOMMENDATIONS
Bernard F. Hearon, James W. Brinkley, Ralph J. Luciani, and Henning E. VonGierke Nov. 1981 21 p refs
(AF Proj. 7231)
(AD-A110199; AFAMRL-TR-81-113) Avail: NTIS HC A02/MF A01 CSCL 06/19

A review of the accident investigation reports of all non-fatal F/FB-111 ejections which occurred from 19 October, 1967 to 26 March 1980 was conducted. The available spinal radiographs of the ejectees were also reviewed. The overall vertebral fracture rate among survived ejectees in a properly functioning module was found to be 29.5% (23 of 78). There was no correlation of these fractures with negative inertia reel strap angles. Five radiologic and orthopedic consultants did not agree on the specific mechanism of vertebral fracture in the involved crewmembers. A significant reduction in the vertebral fracture rate appears achievable only by decreasing the acceleration stresses imposed on the crewmembers during landing impact. GRA

N82-21880# Northwestern Univ., Evanston, Ill. Dept. of Psychology.
SOURCEBOOK OF TEMPORAL FACTORS AFFECTING INFORMATION TRANSFER FROM VISUAL DISPLAYS Final Report
R. Sekuler, P. D. Tynan, and R. S. Kennedy, ed. (Canyon Research Group) Alexandria, Va. Army Research Institute for the Behavioral and Social Sciences 1 Jun. 1981 191 p refs
(Contract N61756-76-M-5961; DA Proj. 2Q1-62722-A-77)
(AD-A109907; ARI-TR-540) Avail: NTIS HC A09/MF A01 CSCL 06/16

Temporal factors in vision are reported. A literature and information search is included. An integrative review of the literature is provided which deals with application of findings to display design. Perception of temporal events - specifically motion perception (real and apparent) and flicker/flash sensitivity is examined. Temporally based phenomena which distort or degrade perception are covered. Features of these phenomena are observed in visual displays. Equations are provided for the calculation of design criteria (e.g., peripheral motion threshold, contrast thresholds, contrast thresholds and age, etc.). General guidelines are offered for incorporating design criteria into perceptions due to temporal events. E.A.K.

N82-21881# Stanford Univ., Calif. Dept. of Computer Science.
SYMBOLIC REASONING AMONG 3-D MODELS AND 2-D IMAGES Ph.D. Thesis
Rodney Allen Brooks Jun. 1981 98 p refs
(Contract MDA903-80-C-0102)
(AD-A110316; STAN-CS-81-861; AIM-343) Avail: NTIS HC A05/MF A01 CSCL 09/2

An implemented and operational model-based vision system is described. Examples are given of its interpretation of images, including extraction of three dimensional parameters from monocular images. Advances are presented in representation for geometric modeling of objects and objects classes, in techniques for manipulating non-linear symbolic algebraic constraints, in geometric reasoning in incompletely specified situations, and in constructing algebraic constraints from image measurements. Both generic object classes and specific objects are represented by volume models which are independent of viewpoint. Complex real world object classes are modeled. Variations in size, structure and spatial relations within object classes can be modeled. New spatial reasoning techniques are described which are useful both for prediction within a vision system, and for planning within a manipulation system. New approaches to prediction and interpretation are introduced, based on the propagation of symbolic constraints. Predictions are two-pronged. First, prediction graphs provide a coarse filter for hypothesizing matches of objects to image features. Second, prediction graphs contain instructions on how to use measurements of image features to deduce three dimensional information about tentative object interpretations. Interpretation proceeds by merging local hypothesized matches, subject to consistent derived implications about the size, structure and spatial configuration of the hypothesized objects. Prediction, description and interpretation proceed concurrently, from coarse object subpart and class interpretations of images, to fine distinctions among object subclasses, and more precise three dimensional quantification of objects.
Author (GRA)

N82-21882# SRI International Corp., Menlo Park, Calif.
PERCEPTION OF SPATIAL FEATURES WITH STEREOSCOPIC DISPLAYS Final Report, 1 Sep. 1979 - 30 Sep. 1981
Thomas P. Piantanida 30 Nov. 1981 60 p
(Contract N00014-79-C-0742; SRI Proj. 8899; NR Proj. 196-162)
(AD-A110191; N14-0742-81C-0002) Avail: NTIS HC A04/MF A01 CSCL 14/5

Two levels of measurement were used in this investigation: subjective measures consisting of observer responses, and objective measures consisting of observer eye movements. Two major experimental techniques were used. These were the selectively stabilized image technique, in which part of the stimulus image was stabilized on the observer's retina; and a motion-in-depth technique that allowed us to measure changes in an observer's perception of three dimensional stimuli. The major findings of this study are: (1) the human stereo mechanisms responsible for the perception of depth and of motion-in-depth are sensitive to different aspects of the retinal images produced by three-dimensional displays than is the form perception mechanism; (2) it is possible to drive the human stereo mechanism with retinal images that do not drive the form perception mechanism; (3) observer variables such as ocular dominance and familiarity with three-dimensional displays interact with the three-dimensional display parameters (image luminance, image contrast, and interocular contrast), but appear not to influence the perception of motion-in-depth in three-dimensional displays during binocular image misregistration. Author

N82-21883# Syracuse Univ., N. Y. Dept. of Mechanical and Aerospace Engineering.
POTENTIAL FOR INTERACTION OF LOW-LEVEL IMPULSE AND CONTINUOUS NOISE
Roger P. Hamernik, Donald Henderson, and Richard Salvi Wright-Patterson AFB, Ohio AMRL Mar. 1981 56 p refs
(Contract F33615-78-C-0513; AF Proj. 2312)
(AD-A109430; AFAMRL-TR-80-68) Avail: NTIS HC A04/MF A01 CSCL 06/19

The purpose of the experiments described in this report was to establish whether a synergistic interaction occurs between relatively low levels of continuous and impulse noise to produce an increased hearing loss and cochlear pathology. Twenty-three monaural chinchillas were used as experimental subjects. The animals were divided into six groups. Each group was exposed 8 hours per day for 8 weeks to various combinations of impulse and continuous noise presented at various levels. Using behavioral conditioning techniques, hearing thresholds were measured before, during, and after noise exposure. After a minimum of 30 days post-exposure the animals were killed and their cochleas were analyzed using the surface preparation technique. Histological results were qualified in the form of a cochleagram. In contrast to earlier findings the results of this study found no evidence of a synergistic interaction when the animals were exposed to a combination of continuous (between 75-85 dB SPL) and impulse (103 dB SPL peak exposure) noise. Author (GRA)

N82-21884# Royal Aircraft Establishment, Farnborough (England).
HUMAN REACTION TO LOW FREQUENCY MOTION: PRELIMINARY STUDIES
C. H. duRoss London HMSO 10 Nov. 1980 45 p refs

(RAE-TM-FS-365; BR77320) Avail: NTIS HC A03/MF A01

A ship motion simulator was used to ascertain the effects of low frequency ship and sinusoidal motion on man and his performance. Ship motion signals based on those recorded at 25 knots into a force 4 wind were employed. Heave, pitch and roll sinusoidal motion in the 0.1 to 0.4 Hz frequency range occurred. A tracing task involving unsupported arm movements was seriously affected by the motion; a tracing task showed a small decrement in performance and a digit keying task was unaffected. There was no evidence that adverse effects were caused by motion sickness. Accelerations measured at the head and hand of subjects resulted in transmissibilities showing that relatively large rotational motions could be induced.

Author (ESA)

N82-21885# Defence Research Information Centre, Orpington (England).

RECORDING BASIC CLIMATIC PARAMETERS AND THEIR PROCESSING INTO INTEGRATED HEAT STRESS INDICES

G. Kleinhanss, C. Piekarski, and E. Haug Mar. 1981 33 p refs Transl. into ENGLISH from Biomedizinische Tech. (Germany), v. 25, no. 1-2 1980 p 12-26

(DRIC-T-6292; BR78677) Avail: NTIS HC A03/MF A01

A method of estimating heat stress and climatic strain on man is described. Mathematical compound values based on simultaneously recorded meteorological factors related to physiological strain in exposed human beings are used. A procedure is presented which simplifies and improves the previous method used for field testing environmental strain of the workplace. With the aid of the mathematical model, it is possible using a simple electronic calculator to calculate the stress from a number of selected heat stress indices. Author (ESA)

N82-21886# Defence Research Information Centre, Orpington (England).

ASPECTS OF THE BODY'S DEFENCE MECHANISMS AS PROTECTION AGAINST BIOLOGICAL AGENTS

Gunilla Eriksson and Thomas Olsson Aug. 1981 14 p refs Transl. into ENGLISH of 'Naagra aspekter paa infektionsfoersvaret som skydd mot biologiska stridsmedel' (Stockholm)

(DRIC-T-6433; FOA-C-40094-B1; BR80179) Avail: NTIS HC A02/MF A01

Factors important in assessing the pathogenic powers of infectious microorganisms, and possible means of protection during biological warfare, were analyzed. Nonspecific defense mechanisms comprise: (1) mechanical protection, (skin, mucous membrane); (2) chemical factors, (antimicrobial substances); (3) inflammatory response, (increased circulation, etc); and (4) phagocytosis, (antimicrobial cell activity). The immune defenses, give specific, but not absolute, protection against infectious diseases. Effects of microorganisms against which there is no immune defense are restricted by antibiotics/chemotherapeutic drugs, and immunotherapy. Author (ESA)

N82-21887# Green (Del) Associates, Inc., San Diego, Calif.

EFFECTS OF SHORT-TERM INTERMITTENT AIR POLLUTANTS ON INCIDENCE AND SEVERITY OF ACUTE RESPIRATORY DISEASE: DATA COLLECTION AND QUALITY ASSURANCE

R. David Flesh, Margaret L. Riha, and Michelle F. Miller 1981 265 p

(Contract EPA-68-02-2749)

(PB82-129479; EPA-600/1-81-065) Avail: NTIS HC A12/MF A01 CSCL 06T

The purpose of this study was to measure the acute response of respiratory disease from peak hourly and daily average exposures to nitrogen dioxide alone and in combination with other pollutants. The study population was made up of families with children attending public elementary schools and living in four California South Coast Air Basin study areas: West Los Angeles/Santa Monica, Garden Grove/Westminister, Glendora/Covina, and Upland/Ontario. The role and responsibility of the contractor were to collect all background and health data, to process and assure the quality of the data and to prepare this report. Families were recruited for participation during the spring and summer months of 1978. Recruitment included face to face interviews for the purpose of collecting family background data. GRA

N82-21888# Washington Univ., St. Louis, Mo. Materials Research Lab.

PHYSICAL TESTING OF POLYMERS FOR USE IN CIRCULATORY ASSIST DEVICES Annual Report, 31 Aug. 1980 - 30 Aug. 1981

J. L. Kardos, W. M. Swanson, R. E. Clark, and C. Migliaresi 31 Aug. 1981 79 p refs

(Contract N01-HV-02910)

(PB82-127069; NIH-N01-HV-02910-1) Avail: NTIS HC A05/MF A01 CSCL 06K

The distribution of fatigue lifetimes under biaxial stress for elastomers was developed. For crack growth under uniaxial fatigue an increase in frequency yielded an almost linear decrease in fatigue life. The predicted lifetimes are shorter than those experimentally measured. Comparison of the time-temperature superposed (TTS) master creep compliance curves with the realtime, longterm creep at 37C indicates the real-time creep to be slightly higher than the TTS predictions. A linear viscoelastic analysis is developed to predict creep under superimposed static and dynamic uniaxial loadings. GRA

N82-21889# Professional Staff Association of the Rancho Los Amigos Hospital, Inc., Downey, Calif.

DEVELOPMENT AND PERSISTENCE OF ADAPTATION TO OZONE EXPOSURE IN OZONE-SENSITIVE SOUTHERN CALIFORNIA RESIDENTS Final Report

William S. Linn and Jack D. Hackney 20 Aug. 1981 33 p refs

(PB82-125899; CRC-APRAC-CAPM-31-79-1-80) Avail: NTIS HC A03/MF A01 CSCL 06E

Eleven healthy volunteer subjects believed to be atypically reactive to ozone were exposed to approximately 0.47 ppm ozone (ultraviolet calibration method) in purified air for four successive days to develop adaptation if possible. They were reexposed similarly once during each of the following five weeks to investigate the persistence of the adaptive response. Exposures lasted two hours and included stresses of heat and intermittent moderate exercise. Responses to ozone were assessed by forced expiratory lung function tests and by subjects' reports of symptoms. For the group as a whole, the time courses of lung function and symptom responses were very similar. For the typical subject in this group, adaptation was partially lost after four ozone-free days, and more or less completely lost after seven ozone-free days. GRA

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N82-21890# Decision Research Corp., Eugene, Oreg.

SUBJECTIVE CONFIDENCE IN FORECASTS

Baruch Fischhoff and Don Macgregor Dec. 1981 48 p refs

(Contract N00014-80-C-0150)

(AD-A109730; PTR-1092-81-12) Avail: NTIS HC A03/MF A01 CSCL 05/10

To be useful, a forecast must not only predict the future, but also give some indication of how much confidence to place in that prediction. The appropriateness of people's confidence in their general knowledge has been studied extensively. After briefly reviewing that literature, the present article attempts to make it more directly relevant to forecasters by repeating previous studies in the context of confidence in forecasts. The most robust of previous results was strongly replicated: participants were greatly overconfident in their predictions when dealing with a fairly hard-to-predict set of events. A procedure that had previously proved effective in reducing overconfidence, forcing respondents to provide reasons why their answers might be wrong, was of minor value here. A new result was the discovery of a simple indicator of the quality of people's confidence assessments, whether they ever expressed certitude. Possible implications of these results for producing and using forecasts are discussed.

Author (GRA)

N82-21891# Decision Research Corp., Eugene, Oreg.
DIAGNOSTICITY AND THE BASE-RATE EFFECT
Baruch Fischhoff and Maya Bar-Hillel Nov. 1981 44 p refs
(Contract N00014-80-C-0150)
(AD-A109731; PTR-1092-81-11) Avail: NTIS
HC A03/MF A01 CSCL 05/1

A common judgmental task involves predicting the category membership of an individual on the basis of information specific to that individual and background information regarding the base rate of different categories. According to statistical theory, predictions may deviate from base rates only to the extent that the individuating information is diagnostic. Previous research has demonstrated that diagnosticity is often judged by 'representativeness', the degree to which the individuating information is differentially suggestive of the different possible categories. Thus, information with high differential representativeness, even if it is worthless (e.g., because its sources are unreliable), will swamp base-rate information. The present studies varied differential representativeness by manipulating the degree to which the prediction categories are similar to one another vis a vis the individuating information, and hence similarly represented by that individuating information. It was found that the effect of the base rate increased systematically as differential representativeness decreased. Representativeness was measured independently by several converging techniques. These measures predicted the magnitude of the base rate over entire sets of descriptions.
Author (GRA)

N82-21892# National Physical Lab., Teddington (England). Acoustics Unit.
A STUDY OF THE EFFECTS OF FLUCTUATION FREQUENCY ON ADVERSE REACTIONS TO NOISE
H. C. Fuller and D. W. Robinson Oct. 1980 28 p refs
(NPL-Ac-97; ISSN-0143-7143) Avail: NTIS
HC A03/MF A01

The effects of the frequency of level fluctuations on the adverse reaction generated by a noise stimulus were investigated. As a result of theoretical considerations, it was suggested that the fluctuation term in the formula for noise pollution level should be weighted according to the frequency of the level fluctuations. Subjects completed a calculation task in a listening room, giving their response on a questionnaire. Test stimuli with levels varying by 10 dB and 20 dB with periods of between 6 and 600 sec were used and the adverse reaction generated after 10 min was measured. The results were examined in relation to the noise ratings L sub NP, L sub EG a measure of the rate of fluctuation of the level, and the proposed modification of L sub NP. None of the four measures fully explains the results, but there is some evidence to support the modification of L sub NP suggesting that only level fluctuations at frequencies between 0.1 Hz and 0.01 Hz contribute to the general adverse reaction.
Author (ESA)

N82-21893# Royal Naval Personnel Research Committee, London (England). Applied Psychology Unit.
COGNITIVE PERFORMANCE, SLEEP QUALITY AND MOOD DURING DEEP OXY-HELIUM DIVING
Vivien J. Lewis and Alan D. Baddeley Jan. 1981 32 p refs
(RPN-1/81) Avail: NTIS HC A03/MF A01

Five dives are reported, lasting between 18 and 26 days, and reaching maximum simulated depths of between 300 meters sea water (msw) and 540 msw. Tests of cognitive functioning, including associative and short term memory, arithmetic ability, perceptual speed, spatial manipulation, grammatical reasoning and semantic processing, were administered to well-practiced subjects prior to each dive, at maximum depth and again during decompression. Self-report measures of sleep and mood questionnaires were administered for a period extending from one week before each dive commenced until at least one week after the dive was completed. The results indicate significant impairments in all performance tasks at maximum depth, except for the tests of associative memory and grammatical reasoning. A significant reduction in sleep and decrease in the subjective level of alertness is found at maximum depth for all dives.
Author (ESA)

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N82-21894*# Stanford Univ., Calif. Biomedical Technology Transfer Program.
MOBILITY AID FOR THE BLIND Final Report, 1 Dec. 1980 - 30 Nov. 1981
Jan. 1982 40 p refs
(Contract NCC2-113)
(NASA-CR-168731; NAS 1.26:168731) Avail: NTIS
HC A03/MF A01 CSCL 05H

A project to develop an effective mobility aid for blind pedestrians which acquires consecutive images of the scenes before a moving pedestrian, which locates and identifies the pedestrian's path and potential obstacles in the path, which presents path and obstacle information to the pedestrian, and which operates in real-time is discussed. The mobility aid has three principal components: an image acquisition system, an image interpretation system, and an information presentation system. The image acquisition system consists of a miniature, solid-state TV camera which transforms the scene before the blind pedestrian into an image which can be received by the image interpretation system. The image interpretation system is implemented on a microprocessor which has been programmed to execute real-time feature extraction and scene analysis algorithms for locating and identifying the pedestrian's path and potential obstacles. Identity and location information is presented to the pedestrian by means of tactile coding and machine-generated speech.
R.J.F.

N82-21895*# Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
SENSITIVITY ANALYSIS AS AN AID IN MODELLING AND CONTROL OF (POORLY-DEFINED) ECOLOGICAL SYSTEMS
G. M. Hornberger and E. B. Rastetter Mar. 1982 23 p refs
(NASA Order A-77478)
(NASA-CR-166308; NAS 1.26:166308) Avail: NTIS
HC A02/MF A01 CSCL 13B

A literature review of the use of sensitivity analyses in modelling nonlinear, ill-defined systems, such as ecological interactions is presented. Discussions of previous work, and a proposed scheme for generalized sensitivity analysis applicable to ill-defined systems are included. This scheme considers classes of mathematical models, problem-defining behavior, analysis procedures (especially the use of Monte-Carlo methods), sensitivity ranking of parameters, and extension to control system design.
N.W.

N82-21896*# National Bureau of Standards, Washington, D.C. Industrial Systems Div.
AN OVERVIEW OF ARTIFICIAL INTELLIGENCE AND ROBOTICS. VOLUME 2: ROBOTICS
William B. Gevarter Mar. 1982 102 p refs
(NASA-CR-168727; NAS 1.26:168727; NBSIR-82-2479) Avail:
NTIS HC A06/MF A01 CSCL 05H

The field of robotics is reviewed. Primitive functions are discussed. Manipulator arms are considered. Actuators are examined. Mobility, end effectors, control, and sensor-controlled robots are covered. Robot vision is discussed, covering determination of pose, feature extraction, object recognition, and future techniques. Programming is addressed. Kinematics and dynamics are considered. Research requirements are taken up. Commercially available robots, vision systems, and other components are discussed. Information sources are provided.
N.W.

N82-21897*# Children's Hospital at Stanford, Palo Alto, Calif. Rehabilitation Engineering Center.
RESEARCH AND DEVELOPMENT OF A VERSATILE PORTABLE SPEECH PROSTHESIS Final Report
Nov. 1981 82 p refs
(NsG-2313)
(NASA-CR-168741; NAS 1.26:168741) Avail: NTIS
HC A05/MF A01 CSCL 05H

The Versatile Portable Speech Prosthesis (VPSP), a synthetic speech output communication aid for non-speaking people is described. It was intended initially for severely physically limited people with cerebral palsy who are in electric wheelchairs. Hence, it was designed to be placed on a wheelchair and powered from a wheelchair battery. It can easily be separated from the wheelchair. The VPSP is versatile because it is designed to accept any means of single switch, multiple switch, or keyboard control which physically limited people have the ability to use. It is portable because it is mounted on and can go with the electric wheelchair. It is a speech prosthesis, obviously, because it speaks with a synthetic voice for people unable to speak with their own voices. Both hardware and software are described. R.J.F.

N82-21898# Oceanautics Inc., Annapolis, Md.
HUMAN ENGINEERING GUIDES TO DESIGN OF DISPLAYS FOR UNDERWATER APPLICATIONS
W. S. Vaughan, Jr. and J. A. S. Kinney (Naval Submarine Medical Research Lab.) Dec. 1981 40 p
(Contract N00014-79-C-0602; NR Proj. 196-157)
(AD-A110317) Avail: NTIS HC A03/MF A01 CSCL 05/5

This report contains recommendations for designers of displays for systems that operate underwater. The recommendations are based on a foundation of research and analyses contained in a companion document (Vaughan and Kinney, 1980). Both the current report and the database document are organized by designer decisions related to the legibility of panel displays and to the visibility of painted objects. Five decisions comprise the content organization of the report: eye-to-console distance, symbol size, display luminance, peripheral location, and use of color. Material presented within each section serves first, to provide a rationale for the significance of human factor considerations to the decision; second, to provide necessary translations of scientific concepts into engineering concepts; third, to state concise recommendations for how to resolve the design issue from the viewpoint of human factors. GRA

N82-21899# Defence Research Information Centre, Orpington (England).
CONCEPTUAL ERGONOMICS: EARLY DETECTION OF FIELD OF VISION RESTRICTIONS BY MEANS OF ERGOSCOPY
H. J. Windberg London HMSO Nov. 1980 16 p refs Transl. into ENGLISH of ERGONOMICS, v. 23, no. 4, 1980 p 341-350
(DRIC-T-6253; BR76774) Avail: NTIS HC A02/MF A01

A photographic apparatus based on the endoscope for determining the field of vision from control positions using scale models is described. Called ergoscopy, the technique uses a pipe with an optical system and a flexible optical conductor cable fitted to a camera. The ergoscope allows the designer to investigate sight angles of operators and recognize hindrances by simulating critical conditions with small scale models. Design mistakes may therefore be eliminated before the 1:1 scale prototype is built. Illustrations with 1:20 and 1:100 models are given. Author (ESA)

N82-21900# Royal Aircraft Establishment, Farnborough (England).
REPORT ON A VISIT TO CANADA OF THE 10-17 MAY 1980 SECOND INTERNATIONAL SYMPOSIUM ON PERSONAL HEARING PROTECTION IN INDUSTRY
J. A. Chillery London HMSO 29 Jan. 1981 24 p Conference held at Toronto, 14-16 May 1980
(RAE-TM-FS-377; BR78127) Copyright. Avail: NTIS HC A02/MF A01

Material presented at the symposium is summarized and evaluated. Several papers cover the testing of protectors, their design and performance, including the objective measurement of ear-plug attenuation, and the miniature microphone method of measuring ear-muff attenuation. Other papers describe an active noise reduction system, correlation between objective and subjective data, correlation between laboratory and field data, and the measurement of headband force. Author (ESA)

N82-21901# Royal Aircraft Establishment, Farnborough (England).
MEASUREMENT OF THE HEADBAND FORCE OF CIRCUMAURAL HEARING PROTECTORS
J. A. Chillery London HMSO 5 Feb. 1981 25 p refs Presented at Inaugural Tech. Meeting of Can. Acoust. Soc., Toronto, 12 May 1980
(RAE-TM-FS-378; BR78249) Avail: NTIS HC A02/MF A01

Circumaural hearing protector design is summarized. Existing force meters for the measurement of the headband force of such protectors are assessed. The construction and preliminary testing of a reliable method for measuring the force with which the protector cups of an earmuff are pressed against the head of a wearer are described together with the necessary modifications, such as changes in dimensions, to enable the device to fit inside, and support, a flight helmet. Author (ESA)

N82-21902# Royal Aircraft Establishment, Farnborough (England).
A TEST FACILITY FOR THE OBJECTIVE MEASUREMENT OF CIRCUMAURAL HEARING PROTECTOR ATTENUATION
J. A. Chillery London HMSO 5 Feb. 1981 33 p refs Presented at 2nd Intern. Symp. on Personal Hearing Protect. in Ind., Toronto, 14-16 May 1980
(RAE-TM-FS-379; BR78126) Avail: NTIS HC A03/MF A01

The development of a facility suitable for quality control work is developed. Published data were surveyed to identify the relative importance of parameters of a protector and the head of a wearer. The most important are the attenuation values of different ear geometries, reproducible leakage simulation and the effect on attenuation values of different types of skin and flesh. The construction of an artificial head and of testing equipment are described. Important factors are high acoustic isolation and simplicity of use. The performance of the device, using various test and sound fields and procedures, was examined. It is found that reliable data are generated. A pilot study on one example of protector is described. Author (ESA)

N82-21903# Royal Aircraft Establishment, Farnborough (England).
THE IMPORTANCE OF EAR-LIKE COUPLERS IN THE DESIGN OF AN OBJECTIVE TEST FACILITY FOR THE MEASUREMENT OF EARMUFF INSERTION LOSS
J. A. Chillery Jan. 1981 24 p refs Presented at 2nd Intern. Symp. on Personal Hearing Protection in Industry, Toronto, 14 May 1980
(RAE-TM-FS-380; BR78125) Avail: NTIS HC A02/MF A01

An objective method of earmuff attenuation measurement is outlined. Experiments were performed on an electronic manikin, a prototype artificial head, and two ear-like couplers. These show that the acoustic behavior of the ear canal and middle-ear is unaffected by a protector covering the outer ear. It is therefore unnecessary to include a simulation of an ear canal or an ear-like coupler in an objective test facility for measuring insertion loss. Data are presented which show that, for insertion loss measurements, the attenuation spectra produced by an objective method are practically independent of the method of acoustically coupling the measuring microphone to the volume contained by the earmuff. This simplifies the design of the objective method. Author (ESA)

N82-21904# Motor Industry Research Association, Lindley (England).
ANTHROPOMETRIC PROFILE OF THE BRITISH CAR OCCUPANT
C. M. Haslegrave and R. N. Hardy 1979 76 p refs Sponsored in part by MEMTRB
(MIRA-1979/2) Avail: NTIS HC A05/MF A01

British car drivers and front seat passengers were anthropometrically surveyed. Seventeen dimensions required in the design of cars were measured. The dimension distributions of the male and female driving populations show variations with age, stature and weight. No significant difference is found between female occupants of either front seat, but male drivers are found to be significantly older and heavier than male passengers, although there was little difference in stature. Comparison with the dimensions of the US civilian population show that where male dimensions are based on American statistics they are adequate for the present British driving population, however, British female drivers are significantly taller than US women. A

factor analysis is used to explore the relationships between dimensions relevant to vehicle design. Three factors are used to construct a set of body indices which are suggested as shape parameters in the definition of a range of anthropometric dummies and models. Author (ESA)

N82-21905# Prins Maurits Lab. TNO, Rijswijk (Netherlands). Inst. for Chemical and Technological Research.
EVALUATION OF THE NBC OVERGARMENTS MANUFACTURED BY SEYNTEX BELGIUM
J. Medema May 1980 19 p ref
(Contracts A78/KL/106; A77/KL/061)
(PML-1980-33; TDCK-73841) Avail: NTIS HC A02/MF A01

A protective clothing system against chemical warfare agents (liquid and vapor) was evaluated. The suit was exposed to a simulated spray attack of mustard gas droplets. The suit was used in combination with ordinary combat clothing in penetration cells. Protection time is defined as the time in which four micrograms/cu cm cloud penetrate. Protection was measured after: (1) outdoor exposure, including rain; (2) 12 hr cycling sweat poisoning tests; (3) 5 years storage; (4) accelerated aging; (5) and 120 passes over an obstacle course. No serious degradation of protection is reported. Author (ESA)

N82-21906# Technical Research Centre of Finland, Espoo. Electrical Engineering Lab.
GUIDELINES FOR MAN-MACHINE INTERFACE DESIGN
Jukka Ranta, Bjoern Wahlstroem, and Rolf Westesson Aug. 1981 135 p refs
(VTT-RR-23/81; ISBN-951-38-1279-0; ISSN-0358-5077)
Avail: NTIS HC A07/MF A01

Guidelines applicable to the design stage of complex process automation systems were designed. Three decision making levels are discerned: (1) decisions are made concerning the launching of the project; general outlines and criteria for later phases are created; (2) the degree of automation, basic interface design, coding system, instrumentation, and procedures are decided; (3) the practical implementation of specified subareas, control system parameter design, or instrumentation scale design. The guidelines ensure that factors affecting decision making are taken into account at each level. Author (ESA)

N82-21151*# Control Data Corp., Minneapolis, Minn.
CABIN OZONE AND TROPOPAUSE DEFINITION
Arthur D. Belmont *In* NASA. Marshall Space Flight Center Proc.: 5th Ann. Workshop on Meteorol. and Environ. Inputs to Aviation Systems Dec. 1981 p 86-89 ref (For primary document see N82-21139 12-01)
Avail: NTIS HC A07/MF A01 CSCL 06K

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N82-21907*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
A GENERAL SOLUTION TO THE HIDDEN-LINE PROBLEM
David R. Hedgley, Jr. Mar. 1982 17 p refs
(NASA-RP-1085; H-1162; NAS 1.61:1085) Avail: NTIS HC A02/MF A01 CSCL 12A

The requirements for computer-generated perspective projections of three dimensional objects has escalated. A general solution was developed. The theoretical solution to this problem is presented. The method is very efficient as it minimizes the selection of points and comparison of line segments and hence avoids the devastation of square-law growth. Author

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering*.

N82-21908*# GTE Information Systems, New York, N. Y.
EXPERIENCE WITH A VECTORIZED GENERAL CIRCULATION WEATHER MODEL ON STAR-100
David B. Soll, Nadim R. Habra, and Gary L. Russell 1977 13 p refs Presented at the Symp. on High Speed Computer and Algorithm Organ., (HICOM) 13-15 Apr. 1977 Prepared in cooperation with Control Data Corp.
(Contract NAS5-23546)
(NASA-CR-166785; NAS 1.26:166785) Avail: NTIS HC A02/MF A01 CSCL 09B

A version of an atmospheric general circulation model was vectorized to run on a CDC STAR 100. The numerical model was coded and run in two different vector languages, CDC and LRLTRAN. A factor of 10 speed improvement over an IBM 360/95 was realized. Efficient use of the STAR machine required some redesigning of algorithms and logic. This precludes the application of vectorizing compilers on the original scalar code to achieve the same results. Vector languages permit a more natural and efficient formulation for such numerical codes. S.L.

N82-21909# National Bureau of Standards, Boulder, Colo. Center for Electronics and Electrical Engineering.
JOSEPHSON A/D CONVERTER DEVELOPMENT Annual Technical Report, 1 May 1980 - 30 Apr. 1981
C. A. Hamilton, R. E. Harris, R. L. Kautz, F. I. Lloyd, and R. L. Peterson Oct. 1981 72 p
(Contract N00014-81-F-0048; NR Proj. 383-040; RF62582001)
(AD-A110081; NBSSR-724-29-81) Avail: NTIS HC A04/MF A01 CSCL 09/5

This report describes the forth year of an effort to demonstrate an ultra-high-speed analog-to-digial converter using superconducting electronics. A converter was fabricted and tested at a sample rate of 4 x 10 to the 9th power samples/second. GRA

N82-21910# Michigan State Univ., East Lansing. Dept. of Chemistry.
COMPUTERS IN SCIENTIFIC INSTRUMENTATION Interim Technical Report
Christie G. Enke 13 Jan. 1982 14 p refs Submitted for publication
(Contract N00014-76-C-1092; NR Proj. 051-634)
(AD-A110008; TR-7) Avail: NTIS HC A02/MF A01 CSCL 09/2

The rapid evolution of computer applications in scientific instrumentation is briefly traced from early data processing to modern computer-based instruments. Computer and interface developments have both contributed to this evolution. The form of the computer used strongly affects the ease of instrument operation and the degree of functional adaptability. Probable pathways toward instruments with increased 'intelligence' include the development and intelligent control of powerful 'multidimensional' instruments, the implementation of hierarchical computer networks and multiprocessor controllers, and the simplification of programming. The importance of the scientist's involvement in these developments is discussed. Author (GRA)

N82-21911# Wisconsin Univ. - Madison. Dept. of Computer Sciences.
IMPLEMENTATION OF THE DATABASE MACHINE DIRECT
Haran Boral, David J. DeWitt, Dina Friedland, Nancy F. Jarell, and W. Kevin Wilkinson Aug. 1981 38 p refs

(Contracts DAAG29-79-C-0165; DAAG29-80-C-0041; DE-AC02-81ER-10920; Grant NSF MCS-78-01721) (AD-A110054; CSTR-442) Avail: NTIS HC A03/MF A01 CSCL 09/2

DIRECT is a multiprocessor database machine designed and implemented at the University of Wisconsin. This paper describes our experiences with the implementation of DIRECT. We start with a brief overview of the original machine proposal and how it differs from what was actually implemented. We then describe the structure of the DIRECT software. This includes software on host computers that interfaces with the database machine; software on the back-end controller of DIRECT; and software executed by the query processors. In addition to describing the structure of the software we will attempt to motivate and justify its design and implementation. We also discuss a number of implementation issues (e.g., debugging the code across several machines). We conclude the paper with a list of the 'lessons' we have learned from this experience. Author (GRA)

N82-21912# Wisconsin Univ. - Madison. Dept. of Computer Science.

A PERFORMANCE EVALUATION OF DATABASE MACHINE ARCHITECTURES

David J. DeWitt and Paula B. Hawthorn Jun. 1981 26 p refs

(Contracts DAAG29-79-C-0165; DAAG29-80-C-0041; W-7405-eng-48; Grant NSF MCS-78-01721) (AD-A110053; CSTR-437) Avail: NTIS HC A03/MF A01 CSCL 09/2

The rapid advances in the development of low-cost computer hardware have led to many proposals for the use of this hardware to improve the performance of database management systems. Usually the design proposals are quite vague about the performance of the system with respect to a given data management application. In this paper we develop an analytical model of the performance of a conventional database management system and four generic database machine architectures. This model is then used to compare the performance of each type of machine with a conventional DBMS. We demonstrate that no one type of database machine is best for executing all types of queries. We also show that for several classes of queries certain database machine designs which have been proposed are actually slower than a DBMS on a conventional processor. Author (GRA)

N82-21913# Royal Signals and Radar Establishment, Malvern (England).

CHECKPOINTING AND ERROR RECOVERY IN DISTRIBUTED SYSTEMS

J. A. McDermid London HMSO Sep. 1980 27 p refs (RSRE-3271; BR76154) Avail: NTIS HC A03/MF A01

Software error recovery and the problem of producing fault tolerant distributed computer systems are discussed. The use of checkpoints in error recovery and alternate strategies for checkpointing are defined. Models of error recovery are described and an existing recovery protocol is extended for certain checkpoint inconsistencies. Protocols which systematically generate checkpoints for use by the recovery protocols, and a protocol for discarding unused checkpoints are defined. Reference is made to the FLEX computer system which incorporates a high speed packet switching communication system, COMPLEX. Author (ESA)

N82-21914# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computer Science.

THE APPLICATION OF DIGITAL SIGNATURES BASED ON PUBLIC KEY CRYOTOSYSTEMS

Donald W. Davies and Wyn L. Price Dec. 1980 35 p refs Submitted for publication

(NPL-DNACS-39/80; ISSN-0143-7348) Avail: NTIS HC A03/MF A01

A true digital signature is defined as a feature which enables anyone to determine for himself the authenticity of a document without being able to forge it. True signatures based on public key cryptosystems, such as that of Rivest, Shamir and Adleman (RSA.), are studied. Methods are proposed for signing documents of any length with a separate signature that can be sent separately, in principle, whether the document is enciphered or not. One method uses the data encryption standard cipher to form a 'digest' of the document for signature. The other uses the same kind of calculation as the RSA cipher and is therefore most useful when RSA hardware is available. The methods proposed are devised to resist a number of types of forgery which defeat the more obvious schemes. The public organization needed to support the widespread use of these signatures is discussed. A registry of public keys and a signature certification service is proposed. Author (ESA)

N82-21915# Engins Matra, Velizy (France).

STUDY REPORT ON THE MOTOROLA MC 68000 MICROPROCESSOR [RAPPORT D'ETUDE DEL SUR LE MICROPROCESSEUR MOTOROLA MC 68000]

Claude Abin 6 Mar. 1981 164 p refs In FRENCH (DEL/CA/269) Avail: NTIS HC A08/MF A01

The 68000 microprocessor is evaluated. Its characteristics, as reported by Motorola and based on performance tests, are described. The use of the 68000 is treated, emphasizing its qualities and the originality of the equipment and logic design. The 68000 family, made up of the peripheral circuits increase the capabilities of the 68000, is presented. Application examples are shown. A library of floating point arithmetic operations, written for the 68000 macro-assembler, is also given. Author (ESA)

N82-21916# Royal Signals and Radar Establishment, Malvern (England).

LECTURE NOTES ON A MACHINE INDEPENDENT COMPILER FOR ATLAS (MICA)

D. P. Taylor Oct. 1980 28 p refs (RSRE-MEMO-3310; BR77228) Avail: NTIS HC A03/MF A01

An abbreviated test language for all systems (ATLAS) was developed for avionics applications in order to provide a standardized language for expressing test specifications and procedures independent of the target automatic equipment (ATE). A baseline ATLAS compiler (MICA) is described which can be modified to suit particular applications. In its baseline form MICA accepts as input an ATLAS program which conforms to a 60% subset of ATLAS 416-1976. It grammatically analyzes the ATLAS program and if correct outputs a coded representation of ATLAS. Further analysis takes place which relates the physical measurement and stimuli resources available on an ATE selected for the research work, to the coded ATLAS program and finally machine code for the ATE is produced. MICA is written in the problem-oriented language CORAL66. An application is shown for a Clansman field test console. Author (ESA)

N82-21917# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computer Science.

PROTOCOL IMPLEMENTATION ASSESSMENT. PHILOSOPHY AND ARCHITECTURE

D. Rayner, ed. Apr. 1981 19 p refs Sponsored by UK Dept. of Industry's Computers, Systems and Electronics Requirement Board

(NPL-DNACS-44/81; ISSN-0143-7348) Avail: NTIS HC A02/MF A01

Philosophy and logical architecture for the assessment of protocol implementations, which is independent of the protocol, service and layer concerned is presented. This is realized by using a simple physical architecture involving remote testing over a communications medium such as Public Services Satellite (PSS) provided that the underlying service is end-to-end. A more sophisticated physical architecture is presented for use when the protocol being tested is encoded onto a non-end-to-end service such as X.25. The architecture was developed with reference to the ISO model for Open Systems Interconnection which specifies seven layers within which protocols can be defined. It can be applied to any protocol in the network layer or above. Author (ESA)

N82-21918# Royal Signals and Radar Establishment, Malvern (England).

FILESTORE MANAGEMENT UNDER THE GEORGE 3 OPERATING SYSTEM

G. D. Whitaker Mar. 1981 15 p ref (RSRE-Memo-3353; BR79450) Avail: NTIS HC A02/MF A01

Storage of programs, etc. of the George 3 system is

explained and a method for controlling both backing store jams and the JUGGERNAUT retrieval program is presented. The algorithm used and its implementation program, are described. The system also succeeds in reducing user retrieves. It can be used to retrieve files from the dump tapes after either a general or a partial restore. Author (ESA)

N82-21919# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computer Science.
FILE TRANSFER PROTOCOLS: COMPARISON AND CRITIQUE
R. W. S. Hale Jul. 1981 66 p refs
(NPL-DNACS-48/81; ISSN-0143-7348) Avail: NTIS HC A04/MF A01

The history, background, and general concepts of file transfer protocols (FTP's) are covered. The architecture, attributes, and protocol structure of existing systems are reviewed. An international standard file protocol is proposed. No specific recommendations are made since the application layer of the International Standards Organization reference model encompasses both protocols and their use while it is not clear where the service interface to an FTP should be placed. Application services, transfer services and supporting protocols are also discussed. Author (ESA)

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N82-21920*# Purdue Univ., Lafayette, Ind.
THE USE OF INTERACTIVE RASTER GRAPHICS IN THE DISPLAY AND MANIPULATION OF MULTIDIMENSIONAL DATA Final Report, 1 Jan. 1979 - 31 Dec. 1980
D. C. Anderson Aug. 1981 135 p refs
(Grant NsG-2192)
(NASA-CR-168744; NAS 1.26:168744) Avail: NTIS HC A07/MF A01 CSCL 09B

Techniques for the review, display, and manipulation of multidimensional data are developed and described. Multidimensional data is meant in this context to describe scalar data associated with a three dimensional geometry or otherwise too complex to be well represented by traditional graphs. Raster graphics techniques are used to display a shaded image of a three dimensional geometry. The use of color to represent scalar data associated with the geometries in shaded images is explored. Distinct hues are associated with discrete data ranges, thus emulating the traditional representation of data with isarithms, or lines of constant numerical value. Data ranges are alternatively associated with a continuous spectrum of hues to show subtler data trends. The application of raster graphics techniques to the display of bivariate functions is explored. Author

N82-21921*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE GEMPAK BARNES OBJECTIVE ANALYSIS SCHEME
S. E. Koch, M. desJardins, and P. J. Kocin Nov. 1981 63 p refs
(NASA-TM-83851; NAS 1.15:83851) Avail: NTIS HC A04/MF A01 CSCL 09B

GEMPAK, an interactive computer software system developed for the purpose of assimilating, analyzing, and displaying various conventional and satellite meteorological data types is discussed. The objective map analysis scheme possesses certain characteristics that allowed it to be adapted to meet the analysis needs GEMPAK. Those characteristics and the specific adaptation of the scheme to GEMPAK are described. A step-by-step guide for using the GEMPAK Barnes scheme on an interactive computer (in real time) to analyze various types of meteorological datasets is also presented. Author

N82-21922# State Univ. of New York at Buffalo. Dept. of Computer Science.
A MODULE TO ESTIMATE NUMERICAL VALUES OF HIDDEN VARIABLES FOR EXPERT SYSTEMS Interim Technical Report, 1 Jul. 1980 - 30 Jun. 1981
Nicholas V. Findler, John E. Brown, Ron Lo, and Han Yong You Nov. 1981 35 p refs
(Grant AF-AFOSR-0220-81; AF Proj. 2304)
(AD-A110256; AFOSR-81-0873TR; TR-190; TR-4) Avail: NTIS HC A03/MF A01 CSCL 09/2

In the area of strategic decision-making, the objective often is to achieve one's own goals and to prevent the achievement of the adversaries' goal. To do so, the decision-maker needs to know, as precisely as possible, the values of the relevant variables at various times. Some of these variables, the open variables, are readily measurable at any time. Others, the hidden variables, can be measured only at certain times, either intermittently or periodically. The authors have implemented a module that can act as a decision-support tool for a variety of expert systems in need of estimates of hidden variables values at any desired time. The estimation is based on generalized production rules expressing stochastic, causal relations between open and hidden variables. The quality of the estimates improves through a multi-level learning process as both the number and the quality of the rules increase. The modularity of these causal relations make incremental expansion and conflict resolution natural and easy. Restricting the set and the domain of pattern formation rules to a reasonable size makes the system effective and efficient. Finally, the system can be easily employed for distributed database applications. Author (GRA)

N82-21923# Naval Ocean Systems Center, San Diego, Calif.
COMPUTER HARDWARE EXECUTIVE: CONCEPT AND HARDWARE DESIGN
Dwight Wilcox Sep. 1981 53 p refs
(ZF66212001)
(AD-A110028; NOSC/TR-721) Avail: NTIS HC A04/MF A01 CSCL 09/2

Large multiprocessing and distributed processing computer systems suffer from diminishing returns in system performance as additional processors are added. The slow execution speed of executive software is one of the principal causes of this phenomenon. The purpose of the executive software is to regulate the time when the various application programs gain access to the computer system resources. This task investigated the potential of special-purpose hardware to eliminate the execution-speed bottlenecks within executive software. A unit, named the Hardware Executive, was designed and fabricated. The Navy standard SDEX/M executive was used as a model. Algorithms were developed for the executive functions of task creation, task dispatching, intratask coordination, real-time clock management, and event-to-task registration and translation. GRA

N82-21924# Rockwell International Corp., Thousand Oaks, Calif. Science Center.
NUMERICAL METHODS FOR 2-DIMENSIONAL PROCESS MODELING Semiannual Technical Report, 1 Jul. - 31 Dec. 1981
W. D. Murphy, W. F. Hall, C. D. Maldonado, and S. A. Louie Jan. 1982 82 p refs
(Contract MDA903-80-C-0498; DARPA Order 3984)
(AD-A110431; SC5271.9SA; SATR-3) Avail: NTIS HC A05/MF A01 CSCL 09/5

Detailed documentation for a user's version of the 2-D process modeling code developed under the present contract has been completed, and is provided as an appendix to this report. This code, which has been named MEMBRE (for Multidimensional Efficient Moving Boundary Redistribution), will follow a single dopant type through multiple process cycles typical of MOSFET fabrication, including nonuniform growth of a field oxide. Input of data is made in the SUPREM format, utilizing as far as possible, subroutines from SUPREM. Simulation of dopant redistribution during a complete fabrication schedule typically requires a few minutes of CPU time on the IBM 3033 or 370/168. A CDC version of the code runs approximately two-and-one-half times faster on the Cyber 176. GRA

N82-21925# Texas Instruments, Inc., Lewisville. Equipment Group.
ADA INTEGRATED ENVIRONMENT 3 COMPUTER PROGRAM DEVELOPMENT SPECIFICATION. VOLUME 4: ADA PROGRAMMING TOOLSET Interim Report, 15 Sep. 1980 -

15 Mar. 1981
Griffiss AFB, N.Y. RADC Dec. 1981 92 p 4 Vol.
(Contract F30602-80-C-0293; AF Proj. 5581)
(AD-A109979; RADC-TR-81-360-Vol-4) Avail: NTIS HC A05/MF A01 CSCL 09/2

The ADA Integrated Environment (AIE) consists of a set of software tools intended to support design, development and maintenance of embedded computer software. A significant portion of an AIE includes software systems and tools residing and executing on a host computer (or set of computers). This set is known as an Ada Programming Support Environment (APSE). This B-5 specification describes, in detail, the design for a minimal APSE, called a MAPSE. Author (GRA)

N82-21926# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
INSPECTION METHODS IN PROGRAMMING Ph.D. Thesis
Charles Rich Jun. 1981 289 p refs
(Contracts N00014-75-C-0643; N00014-80-C-0505; Grant NSF MCS-79-12179)
(AD-A110030; AI-TR-604) Avail: NTIS HC A13/MF A01 CSCL 09/2

The work reported here lies in the area of overlap between artificial intelligence and software engineering. As research in artificial intelligence, it is a step towards a model of problem solving in the domain of programming. In particular, this work focuses on the routine aspects of programming which involve the application of previous experience with similar programs. I call this programming by inspection. Programming is viewed here as a kind of engineering activity. Analysis and synthesis by inspection are a prominent part of expert problem solving in many other engineering disciplines, such as electrical and mechanical engineering. The notion of inspection methods in programming developed in this work is motivated by similar notions in other areas of engineering. This report concentrates on the knowledge base of the programmer's apprentice, which is in the form of a taxonomy of commonly used algorithms and data structures. To the extent that a programmer is able to construct and manipulate programs in terms of the forms in such a taxonomy, he may relieve himself of many details and generally raise the conceptual level of his interaction with the system, as compared with present day programming environments. Also, since it is practical to expend a great deal of effort pre-analyzing the entries in a library, the difficulty of verifying the correctness of programs constructed this way is correspondingly reduced. The feasibility of this approach is demonstrated by the design of an initial library of common techniques for manipulating symbolic data. GRA

N82-21927# University of Southern California, Los Angeles. Intelligent Systems Group.
STRUCTURAL ANALYSIS OF NATURAL TEXTURES Ph.D. Thesis
Felicia M. Vilnrotter Sep. 1981 331 p refs Sponsored in part by Hughes Doctoral Fellowship
(Contract F33615-80-C-1080; DARPA Order 3119)
(AD-A110032; USCIPI-1040; USCISG-100) Avail: NTIS HC A15/MF A01 CSCL 05/8

In this dissertation a general method is presented for the structural analysis of natural texture images. Edge Repetition Arrays (ERAs) are calculated for the edge and direction images corresponding to the natural texture image being analyzed. Each ERA entry is the normalized frequency of occurrence of specific types of edge matches occurring with a particular angle and distance separation. The two types of edge matches sought are for element size and spacing. Hence, a one dimensional structural texture profile can be inferred from the information inherent in these arrays. An algorithm designed to automatically interpret ERA results is presented. This algorithm produces a one dimensional structural description of the texture, and provides a starting point for the two dimensional texture primitive search. A texture primitive extraction algorithms is also developed. It uses the information inherent in the above-mentioned texture description to identify the locations of various type of elements within the texture image. The results produced are in the form of individual and composite texture primitive masks as well as descriptions for the individual texture primitive types. A structural texture description should include information about the manner in which the primitives are arranged within the texture. Since the texture primitive masks pinpoint the texture element locations they can be used to calculate a set of rules which characterize this arrangement. GRA

N82-21928# University of Southern California, Los Angeles. Image Processing Inst.
SHAPE MATCHING AND IMAGE SEGMENTATION USING STOCHASTIC LABELING
Bir Bhanu Aug. 1981 320 p refs
(Contract F33615-80-C-1080; DARPA Order 3119)
(AD-A110033; USCIPI-1030) Avail: NTIS HC A14/MF A01 CSCL 05/8

New results are presented in the areas of shape matching of nonoccluded and occluded objects in two dimensions, surface approximation by polygons, shape matching of objects in three dimensions, and segmentation of images having unimodal distributions. The same stochastic labeling technique is used in both shape matching and segmentation with various extensions. Shape matching is viewed as a segment matching problem. Unlike the previous work in shape matching of 2-D objects, the technique is based on a stochastic labeling procedure which explicitly maximizes a criterion function based on the ambiguity and inconsistency of classification. To reduce the computation time, the technique is hierarchical and uses results obtained at low levels to speed up and improve the accuracy of results at higher levels. This basic technique has been extended to the situation where various objects partially occlude each other to form an apparent object and our interest is to find all the objects participating in the occlusion. In such a case several hierarchical processes are executed in parallel for every participating object in the occlusion and are coordinated in such a way that the same segment of the apparent object is not matched to the segments of different actual objects. These techniques have been applied to two-dimensional shapes represented by polygons and the power of the techniques is demonstrated by the examples taken from synthetic, aerial, industrial and microscope images, where the matching is done after using the actual segmentation methods. GRA

N82-21929# LNK Corp., Silver Spring, Md.
ANALYSIS AND SIMULATION OF DISCRETE DIGITAL IMAGE MATCHING
David Lavine, Barbara A. Lambird, and Laveen N. Kanal Ft. Belvoir, Va. Army Engineer Topographic Lab. Nov. 1981 88 p refs
(Contract DACA76-81-C-0004; DA Proj. 4A7-62707-A-855)
(AD-A110247; ETL-0278) Avail: NTIS HC A05/MF A01 CSCL 09/2

This report evaluates procedures for the approximate registration of digital images to maps and other images. It emphasizes point features and vectors derived from point features for image registration. Labeling and other means of adding definiteness to feature identification are promoted as ways to speed up registration. Clustering algorithms, distribution and type of features, hierarchical matching techniques, and other procedures are investigated with scene and map simulations. Author (GRA)

N82-21930# Martin Marietta Corp., Denver, Colo.
MICROCODE DOCUMENTATION STANDARDS Final Technical Report, 9 Sep. 1979 - 1 Apr. 1981
J. W. Mathews, Jr. Griffiss AFB, N.Y. RADC Oct. 1981 68 p refs
(Contract F30602-79-C-0247; AF Proj. 2526)
(AD-A110383; MRC-81-589; RADC-TR-81-262) Avail: NTIS HC A04/MF A01 CSCL 09/2

Microcode is defined as those instructions residing in either read only or writeable memory that have a one-to-one correspondence to basic operations of hardware elements such as ALU's, multiplexers, selectors, registers, etc. Although the software development process is well understood and appropriate documentation standards exist to monitor the entire life cycle for software, microcode development to date has no such general understanding, nor has a Microcode Documentation Standard yet been established with which to appropriately monitor the microcode life cycle. This report examines the problems associated with the development of microcode and the attendant problem

with establishing a general standard for its development. An approach to the development and documentation of microcode is proposed. Author (GRA)

N82-21931# Metagram, New York, N.Y.
METAGRAM SOFTWARE: A NEW PERSPECTIVE ON THE ART OF COMPUTATION Final Technical Report, 1 May - 31 Oct. 1980
David G. Hays and William L. Benzon Griffiss AFB, N.Y. RADC Oct. 1981 69 p
(Contract F30602-80-C-0180; AF Proj. 9682)
(AD-A110384; RADC-TR-81-118) Avail: NTIS HC A04/MF A01 CSCL 09/2

The report documents the results of a six-month R&D effort consisting of a critical examination and feasibility test of the metagramming technique to assess its innovative utility in providing an improved access to databases in the COINS network. The introduction briefly describes current problems in software development/management and outlines metagramming principles. The first chapter illustrates state-of-the-art limitations of conventional programming. The second chapter elucidates the conceptual foundation of metagramming (multi-level abstraction, cognitive processes) and describes a three-level computational system based on metagramming. The third chapter discusses a continuous evolutionary growth of cognition to progressively higher strata described as a sequence of cognitive jumps, each of them characterized by a greater control over complexity than its predecessor. The historical evolution of computational technology is described in the fourth chapter, prior to highlighting the role of higher-level abstractions and the 'universal executive' inherent in the metagramming strategy of computation. The fifth chapter envisions the development of metagramming technology as a series of successively easier-to-use machines. The problem of control in metagramming processes is addressed in the sixth chapter. GRA

N82-21932# Mitre Corp., Bedford, Mass.
A QUANTIFIABLE METHODOLOGY FOR SOFTWARE TESTING: USING PATH ANALYSIS
Shashi Phoha Dec. 1981 96 p refs
(Contract F29628-81-C-0001; AF Proj. 4130)
(AD-A110196; MTR-8393; ESD-TR-81-259) Avail: NTIS HC A05/MF A01 CSCL 09/2

This report is a comprehensive presentation of a quantatitive methodology for software testing which measures test effectiveness at several different levels of program coverage and establishes confidence levels in the correctness of the program at these levels. Based on the resulting numerical specifications for testing a computer program, quantatitive acceptance criteria are developed. These metrics are sensitive to cost and software criticality factors. The methodology, based on path analysis, is a natural extension of software engineering techniques to quality assurance for well-structured programs. It has been applied successfully, but several practical problems still remain. Application of this methodology to a software development program will provide control and visibility into the structure of the program and may result in improved reliability and documentation. Especially for the Air Force, when it acts only as a monitor, external to the software development process, the methodology provides a framework for proper planning and optimal allocation of test resources by quantifying the effectiveness of a test program and pre-determining the amount of testing required for achieving test objectives. With the proof of the fundamental theorem of program testing in 1975, which establishes testing as the equivalent of a proof of correctness for programs which satisfy some structural constraints, systematic testing has become possibly the only effective means to assure quality of a program of non-trivial complexity. GRA

N82-21933# Intermetrics, Inc., Cambridge, Mass.
ADA INTEGRATED ENVIRONMENT 1 COMPUTER PROGRAM DEVELOPMENT SPECIFICATION, VOLUME 1 Interim Report, 15 Sep. 1980 - 15 Mar. 1981
Griffiss AFB, N.Y. RADC Dec. 1981 74 p 7 Vol.
(Contract F30602-80-C-0291; AF Proj. 5581)
(AD-A109999; RADC-TR-81-358-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 09/2

The ADA Integrated Environment (AIE) consists of a set of software tools intended to support design, development and maintenance of embedded computer software. A significant portion of the AIE includes software systems and tools residing and executing on a host computer (or set of computers). This set is known as an ADA Programming Support Environment (APSE). This B-5 specification describes, in detail, the design for a minimal APSE, called a MAPSE. The requirements for the performance and verification of the phases comprising the ADA compilers for the IBM 370/VM and the Perkin-Elmer 8/32 systems are given. R.J.F.

N82-21934# Intermetrics, Inc., Cambridge, Mass.
ADA INTEGRATED ENVIRONMENT 1 COMPUTER PROGRAM DEVELOPMENT SPECIFICATION, VOLUME 3 Interim Report, 15 Sep. 1980 - 15 Mar. 1981
Griffiss AFB, N.Y. RADC Dec. 1981 81 p 7 Vol.
(Contract F30602-80-C-0291; AF Proj. 6220)
(AD-A110001; RADC-TR-81-358-Vol-3) Avail: NTIS HC A05/MF A01 CSCL 09/2

The command language with which a user selects MAPSE facilities, and establishes the requirements for performance, design, test and qualification of the command processor, a computer program that interpretes and acts upon user commands, is described. R.J.F.

N82-21935# Intermetrics, Inc., Cambridge, Mass.
ADA INTEGRATED ENVIRONMENT 1 COMPUTER PROGRAM DEVELOPMENT SPECIFICATION, VOLUME 4 Interim Report, 15 Sep. 1980 - 15 Mar. 1981
Griffiss AFB, N.Y. RADC Dec. 1981 66 p 7 Vol.
(Contract F30602-80-C-0291; AF Proj. 5581)
(AD-A110002; RADC-TR-81-358-Vol-4) Avail: NTIS HC A04/MF A01 CSCL 09/2

The ADA Integrated Environment (AIE) consists of a set of software tools intended to support design, development and maintenance of embedded computer software. A significant portion of an AIE includes software systems and tools residing and executing on a host computer (or set of computers). This set is known as an ADA Programming Support Environment (APSE). This B-5 specification describes, in detail, the design for a minimal APSE, called a MAPSE. The requirements for MAPSE generation and support (MAPS) are defined. The functional area identified by the term MAPS consists of those elements used in the construction, maintenance, and rehosting of the MAPSE tools (as opposed to programs that are MAPSE tools). R.J.F.

N82-21936# Intermetrics, Inc., Cambridge, Mass.
ADA INTEGRATED ENVIRONMENT 1 COMPUTER PROGRAM DEVELOPMENT SPECIFICATION, VOLUME 5 Interim Report, 15 Sep. 1980 - 15 Mar. 1981
Griffiss AFB, N.Y. RADC Dec. 1981 49 p 7 Vol.
(Contract F30602-80-C-0291; AF Proj. 5581)
(AD-A110003; RADC-TR-81-358-Vol-5) Avail: NTIS HC A03/MF A01 CSCL 09/2

The ADA Integrated Environment (AIE) consists of a set of software tools intended to support design, development and maintenance of embedded computer software. A significant portion of an AIE includes software systems and tools residing and executing on a host computer (or set of computers). This set is known as an ADA Programming Support Environment (APSE). This B-5 specification describes, in detail, the design for a minimal APSE, called a MAPSE. The design and implementation of the ADA library is discussed. The library is designed so that it can maintain a set of compilation units in a well designed state no matter how complex these interrelationships are or how drastically they might change. R.J.F.

N82-21937# Intermetrics, Inc., Cambridge, Mass.
ADA INTEGRATED ENVIRONMENT 1 COMPUTER PROGRAM DEVELOPMENT SPECIFICATION, VOLUME 6 Interim Report, 15 Sep. 1980 - 15 Mar. 1981
Griffiss AFB, N.Y. RADC Dec. 1981 39 p 7 Vol.
(Contract F30602-80-C-0291; AF Proj. 5581)
(AD-A110004; RADC-TR-81-358-Vol-6) Avail: NTIS HC A03/MF A01 CSCL 09/2

The ADA Integrated Environment (AIE) consists of a set of software tools intended to support design, development and maintenance of embedded computer software. A significant portion

of an AIE includes software systems and tools residing and executing on a host computer (or set of computers). This set is known as an ADA Programming Support Environment (APSE). This B-5 specification describes, in detail, the design for a minimal APSE, called a MAPSE. The MAPSE is the foundation upon with which an APSE is built and will provide comprehensive support throughout the design, development and maintenance of ADA software. The MAPSE tools described in this specification include an ADA compiler, linker/loader, debugger, editor, and configuration management tools. The kernal (KAPSE) will provide the interfaces (user, host, tool), data base support, and facilities for executing ADA programs (run time support system). R.J.F.

N82-21938# Intermetrics, Inc., Cambridge, Mass.
ADA INTEGRATED ENVIRONMENT 1 COMPUTER PROGRAM DEVELOPMENT SPECIFICATION, VOLUME 7 Interim Report, 15 Sep. 1980 - 15 Mar. 1981
Griffiss AFB, N.Y. RADC Dec. 1981 25 p
(Contract F30602-80-C-0291; AF Proj. 5581)
(AD-A110005; RADC-TR-81-358-Vol-7) Avail: NTIS HC A02/MF A01 CSCL 09/2

The ADA Integrated Environment (AIE) consists of a set of software tools intended to support design, development and maintenance of embedded computer software. a significant portion of an AIE include software systems and tools residing and executing on a host computer (or set of computers). This set is known as an ADA Programming Support Environment (APSE). This B-5 specification describes, in detail, the design for a minimal APSE, called a MAPSE. The MAPSE test editor, a base tool for the creation and modification of textual material, is discussed. It provides basic editing facilities suitable for editing general texts such as program sources and program documentation. R.J.F.

N82-21939# Georgia Inst. of Tech., Atlanta. Computer Science and Technology Lab.
COMPUTER AIDED SPECIFICATION TESTING SYSTEM (CASTS). VOLUME 1: SYSTEM DOCUMENTATION Final Report
D. E. Humphrey and D. P. Millard 15 Mar. 1981 182 p refs 3 Vol.
(Contract DAAK70-79-D-0087)
(AD-A110120) Avail: NTIS HC A09/MF A01 CSCL 05/5

The U.S. Army Institute for Research and Management Information and Computer Sciences (AIRMICS) has conducted research in the area of human factors and the man-machine interface. As a result of this research, a pilot system for testing the adequacy of functional specifications has been developed. The concepts demonstrated in this pilot system received a favorable review by several elements within the U.S. Army Computer Systems Command (USACSC). The tasks contained in the Statement of Work of the present contract have been designed to expand the concepts of the pilot system to create a tool for use by USACSC and the Army. The Computer Aided Specification Testing System (CASTS) is a tool for the design of interactive data entry systems. The CASTS project is concerned specifically with the development of this tool. The work is divided into two processes within the CASTS system: The first process is that used by the designer to construct simulations of interactive video display terminal dialogue and the second process gathers the performance data of an actual user who runs the simulation designed in process I of the system. GRA

N82-21940# Georgia Inst. of Tech., Atlanta. Computer Science and Technology Lab.
COMPUTER AIDED SPECIFICATION TESTING SYSTEM (CASTS). VOLUME 2: USER'S MANUAL Final Report
D. E. Humphrey and D. P. Millard 15 Mar. 1981 65 p refs 3 Vol.
(Contract DAAK70-79-D-0087)
(AD-A110121) Avail: NTIS HC A04/MF A01 CSCL 05/5

CASTS is a software system for use as a tool in the development of interactive data entry systems. It is composed of two major processes: (1) System Specification (Process I); and (2) System Simulation (Process II). The significant advantage of using CASTS is the capability for the system designer to return to the model construction phase of design to change specifications as often as necessary without major re-entry of the same information. Iterative refinements allow testing and modification of specifications without investing considerable coding effort in the initial system design process. In addition, the system designer utilizes an interactive tool which can provide valuable experience in designing other interactive systems. GRA

N82-21941# Georgia Inst. of Tech., Atlanta. Computer Science and Technology Lab.
COMPUTER AIDED SPECIFICATION TESTING SYSTEM (CASTS). VOLUME 3: COBOL PROGRAMMING CONVENTIONS Final Report
D. E. Humphrey and D. P. Millard 15 Mar. 1981 26 p refs 3 Vol.
(Contract DAAK70-79-D-0087)
(AD-A110122) Avail: NTIS HC A03/MF A01 CSCL 05/5

The Computer Aided Specifications Testing System (CASTS) is a tool to aid in the design of interactive systems. It is concerned with human factors and the man-machine interface during the initial capture of data and the editing of that data. CASTS is divided into two processes. The first process is that used by the designer to construct simulations of interactive video display terminal dialogue; the second process gathers the performance data of an actual user who runs the simulation designed in the first process. Author (GRA)

N82-21942# Texas Instruments, Inc., Lewisville. Equipment Group.
ADA INTEGRATED ENVIRONMENT 3 COMPUTER PROGRAM DEVELOPMENT SPECIFICATION. VOLUME 1: ADA SOFTWARE ENVIRONMENT Interim Report, 15 Sep. 1980 - 15 Mar. 1981
Griffiss AFB, N.Y. RADC Dec. 1981 185 p refs 4 Vol.
(Contract F30602-80-C-0293; AF Proj. 5581)
(AD-A109976; RADC-TR-81-360-Vol-1) Avail: NTIS HC A09/MF A01 CSCL 09/2

The Ada Integrated Environment (AIE) consists of a set of software tools intended to support design, developement and maintenance of embedded computer software. A significant portion of an AIE includes software systems and tools residing and executing on a host program computer (or set of computers). This set is known as an Ada Programming Support Environment (APSE). This B-5 Specification describes, in detail, the design for a minimal APSE, called a MAPSE. The MAPSE is the foundation upon which an APSE is built and will provide comprehensive support throughout the design, development and maintenance of Ada software. The MAPSE tools described in this specification include an Ada compiler, linker/loader, debugger, editor, and configuration management tools. The kernel (KAPSE) will provide the interfaces (user, host, tool), database support, and facilities for executing Ada programs (runtime support system). Author (GRA)

N82-21943# Texas Instruments, Inc., Lewisville. Equipment Group.
ADA INTEGRATED ENVIRONMENT 3 COMPUTER PROGRAM DEVELOPMENT SPECIFICATION. VOLUME 2: ADA DATABASE SUBSYSTEMS Interim Report, 15 Sep. 1980 - 15 Mar. 1981
Griffiss AFB, N.Y. RADC Dec. 1981 44 p 4 Vol.
(Contract F30602-80-C-0293; AF Proj. 5581)
(AD-A109977; RADC-TR-81-360-Vol-2) Avail: NTIS HC A03/MF A01 CSCL 09/2

This part of this specification establishes the requirements for performance, design, test, and acceptance of a computer program configuration item identified as the Ada Database Subsystem, CPCI C02. This CPCI contains the following computer program components: Database Interface (DI); Database Directory Manager (DDM); Database Dictionary Utility (DDU); Database Archive Manager (DAM); Database Utilities (DUs); User Information Manager (UIM); User Information Utility (UIU); Host Filesystem Interfaces (HFI). The Database Subsystem is provided on all computer systems supporting the Ada Integrated Environment. Author

N82-21944# Texas Instruments, Inc., Lewisville. Equipment Group.

ADA INTEGRATED ENVIRONMENT 3 COMPUTER PROGRAM DEVELOPMENT SPECIFICATION. VOLUME 3: ADA OPTIMIZING COMPILER Interim Report, 15 Sep. 1980 - 15 Mar. 1981

Griffiss AFB, N.Y. RADC Dec. 1981 194 p refs 4 Vol.
(Contract F30502-80-C-0293; AF Proj. 5581)
(AD-A109978; RADC-TR-81-360-Vol-3) Avail: NTIS HC A09/MF A01 CSCL 09/2

This specification establishes the requirements for the performance, design, test and acceptance of a computer program identified as the Ada optimizing compiler. This CPCI provides a programmer or test engineer with the ability to compile Ada compilation units. The compiler is hosted on the IBM 370 operating under the Ada Integrated Environment (AIE), or on the Interdata 8/32 under the Ada Integrated Environment.

Author

N82-21945# Naval Training Analysis and Evaluation Group, Orlando, Fla.

TEXT AND ILLUSTRATION PROCESSING SYSTEM (TIPS) USER'S MANUAL. VOLUME 2: GRAPHICS PROCESSING SYSTEM

Ray Cox and Richard Braby Aug. 1981 170 p refs
(AD-A109779; TAEG-107) Avail: NTIS HC A08/MF A01 CSCL 09/2

This manual describes a graphics processing system developed by the Training Analysis and Evaluation Group. This volume contains the procedures to teach the relatively inexperienced author how to enter and process graphic information. It describes the illustration processing routines including scanning graphics into computer memory, displaying graphics, enhancing them in various ways, and adding annotations and overlays. It also describes routines for managing both active files and archives.

GRA

N82-21946# Royal Signals and Radar Establishment, Malvern (England).

THE USE OF THE IEEE-488 BUS AND THE MASCOT PHILOSOPHY IN AUTOMATIC TEST EQUIPMENT

M. OBrien London Sep. 1980 22 p refs
(RSRE-Memo-3285; BR76468) Avail: NTIS HC A02/MF A01

A microcomputer based Intel 8085 device was built to simulate an item of automatic test equipment (ATE). The IEEE-488 bus controller interface was designed to operate with an intel SBC 80/10 microcomputer, and a set of software routines are listed written in Intel 8080 assembly language for testing. The MASCOT (Modular Approach to Software Construction Operation and Test) design method is described, and the modules used in the test system are given. Use of the IEEE-488 bus is shown to have simplified many of the design and construction problems associated with conventional ATE systems. The IEEE-488 bus could potentially be applied to limited digital testing if used with an intelligent instruments, such as a logic analyzer.

Author (ESA)

N82-21947# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium).

A SIMPLE METHOD FOR PRODUCING PUNCHED TAPES FOR NUMERICALLY CONTROLLED TOOLS [UN MOYEN SIMPLE DE PREPARER LES BANDES PERFOREES FOUR MACHINES A COMMANDE NUMERIQUE]

Jan Blommaert Sep. 1980 23 p In FRENCH
(CRIF-NT-18) Avail: NTIS HC A02/MF A01

An editor for numerical control programs was implemented on a microcomputer. The editor can be personalized for a specific set of machine tools through modifications of several data files held in erasable programmable read only memory. These modifications are entered through a keyboard in response to prompting by the program. The numerical control program is entered by means of a paper tape reader. Program blocks can be displayed on the screen, corrections entered where desired or systematic substitutions made of one word by another. Coordinates formats are changeable in terms of zero fill and location of the decimal point. The editor commands are listed and explained.

Author (ESA)

N82-21948# Royal Signals and Radar Establishment, Malvern (England).

PRODUCTION OF HIERARCHIC CHECKPOINT STRUCTURES

J. A. McDermid Dec. 1980 11 p refs
(RSRE-3322; BR77585) Avail: NTIS HC A02/MF A01

Checkpoints and their causal relationships are modeled by means of occurrence graphs. An algorithm is presented in occurrence graph terms, which can be used to produce sets of checkpoints at varying levels of detail from that at the lowest level. An informal proof of the correctness of the algorithm is presented. In order to ensure that the operation of application software running on a fault tolerant computer may be continued after a fault has arisen, the execution of that software may be checkpointed. It is desirable to produce sets of checkpoints at a hierarchy of levels in the system to allow recovery to take place on a scale commensurate with the component which has failed. An experimental implementation of the algorithm on a simulated multicomputer system is briefly described.

Author (ESA)

N82-21949# Royal Signals and Radar Establishment, Malvern (England).

AN EXPERIMENTAL IMPLEMENTATION OF ATLAS PROGRAMS ON AN IEEE-488 BUS STRUCTURED ATE

D. P. Taylor Oct. 1980 13 p refs
(RSRE-Memo-3284; BR77373) Avail: NTIS HC A02/MF A01

A multiuser PDP 11/40 was used as host computer for compiling Abbreviated Test Language for All Systems (ATLAS) programs into an intermediate code. The feasibility of using the host computer to target the automatic test equipment (ATE) concept, combining the two standards (ATLAS and the IEEE-488 bus) was examined. The intermediate code was physically transported to an INTEL microprocessor development system (MDS) where it was translated, via a translator written in Pascal, into a pseudo IEEE-488 bus language. The pseudo-language consists of macro calls, the macro definitions being in the form of CORAL 66 with assembly code inserts. The pseudo-language thus formed the basis of a CORAL 66 program which was compiled on the MDS. The Modular Approach to Software Construction and Test (MASCOT) philosophy was followed using a MDS based MASCOT supervisor and kernel.

Author (ESA)

N82-21950# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computer Science.

AMENDMENTS TO HANDBOOK FOR AUTOMATIC COMPUTATION, VOLUME 2

S. Hammarling, P. D. Kenward, and Hilary J. Symm Jan. 1981 26 p ref
(NPL-DNACS-41/81-Vol-2; ISSN-0143-7348) Avail: NTIS HC A03/MF A01

The procedures in the two parts of the handbook are taken in separate sections. Each section starts with a list of all the procedures in that part in alphabetical order, 41 in each. The list gives the page numbers of the handbook on which the procedure appears, and an indication as to whether any change was made. The NPL Subroutine Library number is given where appropriate. Each section details all changes to procedures taken in the order in which they appear in handbook. Where possible, an indication is given as to why, when and by whom the change was made. All those routines that are based on the QR-algorithm terminated if a particular eigenvalue was not obtained in 30 iterations.

Author (ESA)

N82-21951# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.

COMPUTER AIDED COMPLEXITY CLASSIFICATION OF DETERMINISTIC SCHEDULING PROBLEMS

B. J. Lageweg, E. L. Lawler (Calif. Univ., Berkeley), J. K. Lenstra, and A. H. G. RinnooyKan (Erasmus Univ.) Mar. 1981 23 p refs Submitted for publication
(Grants NSF MCS-78-20054; NATO-9.2.02(SRG.7))
(MC-BW-138/81) Avail: NTIS HC A02/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 3,15

Results obtained by a computer program which is used to maintain a record of the known complexity results for a class of 4536 machine scheduling problems are presented. The input

consists of a listing of known 'easy' problems and a listing of known 'hard' problems. The program employs the structure of the problem class to determine the implications of these results. The output provides a listing of essential results in the form of maximal easy and minimal hard problems as well as listings of minimal and maximal open problems, which are helpful in indicating the direction of future research. Author (ESA)

N82-21952# Royal Aircraft Establishment, Farnborough (England).
NECESSARY AND SUFFICIENT CONDITIONS IN NONLINEAR OPTIMIZATION
J. J. Skrobanski Jan. 1981 54 p refs
(RAE-TM-AERO-1888; BR77783) Avail: NTIS HC A04/MF A01

Nonlinear programming, Lagrange multipliers, the Kuhn-Tucker conditions and the duality theorem are introduced. The foundations of the theory were examined. Special cases of one or two dimensions are considered and extended by means of vector differentiation notation to the case of n variables. The problem of unconstrained minimization, the equation constrained problem, and the general constrained problem are outlined. The Jacobian assumption is also discussed. Author (ESA)

N82-21953# Royal Aircraft Establishment, Farnborough (England).
PRODUCTION OF CHEMICAL STRUCTURE DRAWINGS USING AN INTERACTIVE GRAPHICS SYSTEM
G. Sharples Feb. 1981 57 p refs
(RAE-TR-81030; RAE-IT-171; BR79132) Avail: NTIS HC A04/MF A01

A series of computer programs which allows drawings of complex chemical structures to be displayed on a graphics terminal, to be modified using the graphical input devices, and to be drawn by an incremental plotter, is described. The system provides a means for the interactive development of chemical structure diagrams and for the production of high quality drawings suitable for inclusion in published reports. It is based on the graphical definition of several hundred chemical groups. The structure of more complex compounds can be built up from these basic units and displayed to the user. Optional features of the system include variation of the scale of drawing, interactive modification of the drawings, using a light pen and automatic detection, and prevention of drawing overlaps. Author (ESA)

N82-21954# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computer Science.
AN INTRODUCTION TO THE STANDARD SYNTACTIC METALANGUAGE
R. S. Scowen Jul. 1981 18 p
(NPL-DNACS-47/81; ISSN-0143-7348) Avail: NTIS HC A02/MF A01

General principles of standard syntactic metalanguage, the basic form of a syntax rule, reading syntax rules, writing syntax rules clearly, the precedence of the metalanguage operators, limitations of the syntactic metalanguage, the character sets and the syntactic metalanguage used to define its own syntax are discussed. The examples are taken from FORTRAN and PASCAL. The syntactic metalanguage is useful whenever a formally defined language is required, e.g., for references in scientific reports. Author (ESA)

N82-21955# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computer Science.
ADA-EUROPE GUIDELINES FOR THE PORTABILITY OF ADA PROGRAMS
John C. D. Nissen, Peter Wallis, Brian Wichmann, John Barnes, Ted Dowling, Stephen Goldsack, Hans Jeanrond, Carlo Montangaro, Alan Monthomery, Ole Oest et al Nov. 1981 41 p refs
(NPL-DNACS-52/81; ISSN-0143-7348) Avail: NTIS HC A03/MF A01

A users guide for designing and coding portable ADA programs is supplied. Layout and numbering follow the ADA language reference manual. Tasks, program structure, compilation issues, exceptions, generic program units, representation specifications, implementation dependent features, input/output routines, lexical elements, declarations, types, names, expressions, statements, subprograms, packages, and visibility rules are covered. Guidelines are classified as mandatory, recommended, or suggested. Author (ESA)

N82-21956# Science Research Council, Chilton (England).
SON OF BIG EARS
P. Haskell 1981 39 p refs
(PB82-132077; RL-81-068) Copyright. Avail: NTIS HC A03/MF A01 CSCL 09B

The report serves as a reference manual to users of the GRACES computer program. Software engineering changes are described. GRA

62 COMPUTER SYSTEMS

Includes computer networks.

N82-21957# Aeronautical Research Labs., Melbourne (Australia).
HYBRID COMPUTING SYSTEM MARK 3 SOFTWARE REFERENCE MANUAL
H. A. Thelander Jan. 1981 40 p refs
(ARL/Sys-Note-76; AR-002-253) Avail: NTIS HC A03/MF A01

Hybrid Computing System Mark 3 (HCS3) comprises the A.R.L. DECsystem-10 central timesharing digital computer and the Modular Analogue Computer. In HCS3, digital programs are prepared in FORTRAN and use calls to subprograms in the system software package H3PAC to perform hybrid computations. The reference manual for the HCS3 digital applications programmer is provided. It describes the calling and argument conventions, and the functions, of the subprograms in H3PAC. It also describes the associated PDP-11/20 disk utility package RKPAC, used after some HCS3 operations for recovery of data logged during computation. Author

N82-21958# TRW Defense and Space Systems Group, Redondo Beach, Calif.
LONG RANGE PLAN FOR EMBEDDED COMPUTER SYSTEMS SUPPORT. VOLUME 1: EXECUTIVE OVERVIEW Final Report, Dec. 1980 - Aug. 1981
Oct. 1981 26 p refs
(Contract F33600-79-C-0540)
(AD-A109380; TRW-34330-6004-UT-00) Avail: NTIS HC A03/MF A01 CSCL 09/2

The life cycle support of the ever increasing number of computer systems embedded in weapon systems is a major challenge to the Air Force. With continued operational and support emphasis on performance and responsiveness to a dynamic mission environment, significant enhancement of support capabilities for all categories of embedded computer systems, (ECS) is required. This report contains recommendations for acquiring such capabilities. Concurrent implementation of the administrative initiatives combined with the four programmatic initiatives is recommended to address ECS life cycle support. Early implementation of the administrative initiatives is needed not only to correct deficiencies in the acquisition and operation of ECS support systems in the near term, but to establish a clear framework of policy and guidance for AFLC interactions and coordination with the development and user commands; early implementation is also required to enable the subsequent actions necessary for enhancing existing capabilities and acquiring new capabilities to improve the ECS support process through implementation of the programmatic initiatives. The recommendations for each initiative related to the ECS support process, with anticipated benefits, estimated resources, and the development period required for improving the overall future ECS support posture, are summarized. GRA

N82-21959# Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.
STUDY OF A HETEROGENEOUS DISTRIBUTED MICROCOMPUTER NETWORK USING MEASURED DATA AND ANALYTICAL/SIMULATION MODELS Annual Report, 15 Jun. 1980 - 15 Jun. 1981
J. L. Hammond, J. H. Schlag, D. K. Lam, D. N. Murray, and P. J. P. OReilly Jul. 1981 159 p refs
(Grant DAAG29-80-K-0009)

(AD-A110069; E21-616) Avail: NTIS HC A08/MF A01 CSCL 09/2

This study has been concerned with exploring the characteristics of a network with potential application in management information systems using both analytical/simulation models (developed in the study) and measured data obtained from the network models. The network used has been constructed in the School of Electrical Engineering at Georgia Tech with support from AIRMICS. A significant feature of the proposed program has been the approach of dealing with both experimental data from the physical network and results from analytical/simulation models. The completed study has been directed toward an enhanced understanding of heterogeneous, distributed microprocessor networks. Monitor equipment has been studied, installed and used to obtain experimental data on the operation of the network and analytical/simulation models were tailored to describe as accurately as possible the operation of the actual network. The results of the study are models which accurately describe network behavior. These models, which depend explicity on well-defined parameters, provide the facility to investigate alternative designs and to predict network behavior for many types of inputs, such as would be specified for particular management information systems. GRA

N82-21960# IIT Research Inst., Rome, N.Y.
NATIONAL SOFTWARE WORKS TOOL IMPLEMENTATION Final Technical Report, Sep. 1979 - Jun. 1981
Clifford E. Carroll and John J. Dobmeier Griffiss AFB, N.Y. RADC Nov. 1981 54 p refs
(Contract F30602-79-C-0239; AF Proj. 2526)
(AD-A110381; RADC-TR-81-308) Avail: NTIS HC A04/MF A01 CSCL 09/2

The objective of this effort was to develop and apply guidelines, standards, and procedures for the selection, installation, and maintenance of software tools on the National Software Works (NSW), a network of computers which is a subset of the DoD-wide ARPANET system of computers. This was the first step in the establishment of the function of a Tool Manager role within the NSW community. A 'Tool Configuration and Quality Management Plan' was developed to provide a framework for the classification, selection, installation, maintenance, and control of tools on the NSW. Author (GRA)

N82-21961# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computer Science.
THE DEMOS MULTICOMPUTER RING: THE RING CLOSER. A TECHNICAL DESCRIPTION OF ONE OF THE HARDWARE MODULES OF THE MK1 DEMOS COMMUNICATIONS RING
P. T. Neale Oct. 1980 85 p refs
(NPL-DNACS-36/80; ISSN-0143-7348) Avail: NTIS HC A05/MF A01

The ring uses a 16 bit parallel data bus connecting up to 254 minicomputers, with the ring closer RC being a device for generating master clock pulses which drive the ring. The RC also detects and displays start-of-packet errors and detects nonexistent source addresses in used, circulating packets. The crystal controlled clock generator is constructed around a Motorola MC12061L oscillator amplifier. Logic is described for the buffering of input data, packet framing on the ring using an elastic buffer, error logging, and output. A physical description of the hardware is given. This outlines the principal electrical and mechanical features of the RC and demonstrates the modularity of the Ring system. Some of the more important engineering problems impinging on the design of the RC are explained. Circuit diagrams of the logic are included. Author (ESA)

N82-21962# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computer Science.
SURVEY OF NETWORK INDEPENDENT FILE TRANSFER (NIFTP) PROTOCOL IMPLEMENTATIONS
G. W. Cowin and D. Rayner Apr. 1981 58 p refs
(NPL-DNACS-45/81; ISSN-0143-7348) Avail: NTIS HC A04/MF A01

A protocol to facilitate the movement of files among various systems connected to computer networks in the United Kingdom was designed. Implementers, mainly research facilities and universities were surveyed. Existing and planned implementations within and outside the United Kingdom are listed. Location of the site, person responsible, computer and operating system are given. Network names, language availability of source code, status and program size are also provided. Author (ESA)

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N82-21963# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
RESEARCH IN KNOWLEDGE REPRESENTATION FOR NATURAL LANGUAGE UNDERSTANDING Annual Report, 1 Sep. 1980 - 31 Aug. 1981
William A. Woods, C. L. Sidner, M. Bates, Robert J. Bobrow, Ronald J. Brachman, P. R. Cohen, D. J. Israel, and S. L. Webber Nov. 1981 255 p refs
(Contract N00014-77-C-0378; ARPA Order 3414)
(AD-A109648; BBN-4785) Avail: NTIS HC A12/MF A01 CSCL 09/2

This report summarizes the research of BBN's ARPA-sponsored Knowledge Representation for Natural Language Understanding project during its fourth year. In it we report on advances, both in theory and implementation, in the areas of knowledge representation, natural language understanding, and abstract parallel machines. In particular, we report on theoretical advances in the knowledge representation system KL-ONE, extensions to the KL-ONE system, and new uses of KL-ONE in the domain of knowledge about graphic displays. We report on a design for a new prototype natural language understanding system, on issues in cascaded architectures for interaction among the components of a language system, and on a module for Lexical acquisition. In addition, we examine three topics in discourse: a new model of speaker meaning, which extends our previous work on speakers' intentions, an investigation of reference planning and identification, and a theory of 'one'-anaphora interpretation. Our discussion of abstract parallel machines reports on a class of algorithms that approximate Quillian's (49) ideas on the function of human memory. Author (GRA)

N82-21964# Louisiana State Univ., Baton Rouge. Dept. of Electrical Engineering.
SELECTED PROBLEMS IN SYSTEMS ENGINEERING Final Report
William A. Porter Nov. 1981 8 p refs
(Grant AF-AFOSR-3500-78)
(AD-A110300; AFOSR-81-0884TR) Avail: NTIS HC A02/MF A01 CSCL 09/3

This report deals with two types of signal processing and control applications. The first area of concentration is nonlinear filtering and signal extraction. In particular, polynomic filter theory has been extended to the point where optimal causal filters can be specialized for several signal extraction problems. A direct comparison of the power of nonlinear filters has been explored and some of the computational aspects of polynomic filters have been investigated. The second area of research is that of multidimensional system theory. Such theories are central to image processing, robotics and would seem to impact artificial intelligence and other related sciences. In recent months a fundamental operator factorization problem has been solved and initial studies of rapid computation are completed. A specification of special purpose computer architecture for rapid on line processing of multidimensional signals is within each although not yet in hand. The research conducted under the grant has featured an operator theoretic approach. The concept of 'state' is secondary in most of our results. This is felt to have been a distinctive feature. Author (GRA)

N82-21965# Systems Control, Inc., Palo Alto, Calif. Computer Science Dept.
CODIFICATION OF PROGRAM SYNTHESIS KNOWLEDGE FOR CONCURRENT PROGRAMS, YEAR 2 Final Report, 1 Jul. 1979 - 30 Sep. 1981
Daniel Chapiro and Cordeli Green Sep. 1981 16 p refs
(Contract F49620-79-C-0137; AF Proj. 2304)

(AD-A110224; SCI-ICS-L-81-1; AFOSR-81-0895TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

Research on the codification of concurrent programming knowledge is summarized. The general goal to codify programming knowledge and to create programming systems that employ this knowledge to assist in various programming activities including specification, synthesis, modification, debugging, and maintenance. The aim is to produce knowledge based design tools to help with problems in this area. Generation of a concurrent microcode was considered. A basic parallelism operator was introduced with the intent to refine parallel programs specified using this operator into microcode. A brief description of how the hardware architecture effects the level of parallelism exploited in the microcode is given and issues in the automatic generation of compact yet fast microcode are considered. Some advantages of microcode programming by refinement of high level specifications are brought up, namely exploiting high level parallelism, and assurance of correctness of the resulting code. The refinement paradigm requires intermediate level constructs and search for efficient implementations. An example was devised to see if macroparallelism in the high level specification was carried over in the microcode. GRA

N82-21966# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Industrial Engineering and Operations Research.

THE SOJOURN TIME IN A THREE NODE, ACYCLIC, JACKSON QUEUEING NETWORK

Peter Kiessler and Ralph L. Disney 27 Jan. 1982 20 p refs (Contract N00014-77-C-0743)

(AD-A110412; VTR-8203) Avail: NTIS HC A02/MF A01 CSCL 12/1

In this paper we consider the three node, acyclic, Jackson queueing network discussed by Simon and Foley (1980). We provide a solution to the sojourn time problem for a given customer. To the best of our knowledge, this is the first solution to the sojourn time problem in any acyclic Jackson network with overtaking. Author (GRA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N82-21967*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

SCALED RUNGE-KUTTA ALGORITHMS FOR TREATING THE PROBLEM OF DENSE OUTPUT

M. Kathleen Horn Mar. 1982 76 p refs

(NASA-TM-58239; NAS 1.15:58239; S-513) Avail: NTIS HC A05/MF A01 CSCL 12A

A set of scaled Runge-Kutta algorithms for the third- through fifth-orders are developed to determine the solution at any point within the integration step at a relatively small increase in computing time. Each scaled algorithm is designed to be used with an existing Runge-Kutta formula, using the derivative evaluations of the defining algorithm along with an additional derivative evaluation (or two). Third-order, scaled algorithms are embedded within the existing formulas at no additional derivative expense. Such algorithms can easily be adopted to generate interpolating polynomials (or dependent variable stops) efficiently. Author

N82-21968# National Research Inst. for Mathematical Sciences, Pretoria (South Africa). Dept. of Applied Mathematics.

LINEAR PARTIAL DIFFERENTIAL EQUATIONS OF THE SOBOLEV-TYPE M.S. Thesis

Gerhard Wilhelm Reuter Sep. 1980 82 p refs In AFRIKAANS; ENGLISH summary

(TWISK-178) Avail: NTIS HC A05/MF A01

Linear partial differential equations of the Sobolev-type M sub u sub t (x,t) + L u(x,t) = f(x,t) are dealt with a bounded domain omega in R(n). The M and L are elliptic differential operators of orders 2m and 2l respectively with m and l positive integers. Also considered is a homogeneous Dirichlet condition of order k = max(m,l) posed on the boundary of omega, while an initial-value condition in H sub o of order k (omega) is assumed given. Phenomena in fluid and rocks mechanics which motivate the study of the Sobolev equation are discussed. Subsequently some basic results of functional analysis are reported, special attention being given to the theory of bilinear forms in Hilbert spaces and strongly continuous semi-groups of bounded linear operators. It is proved that a unique weak solution to a generalized initial value problem for the Sobolev equation exists. A pseudo-parabolic form of the equation is also considered. M.G.

N82-21969# Brown Univ., Providence, R. I. Center for Dynamical Systems.

INFINITE DIMENSIONAL DYNAMICAL SYSTEMS

Jack K. Hale 12 Nov. 1981 27 p refs

(Contract DAAG29-79-C-0161; Grants AF-AFOSR-3092-76; NSF MCS-79-05774; AF Proj. 2304)

(AD-A110257; LCDS-TR-81-22; AFOSR-81-0877TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

An approach is outlined for the discussion of the qualitative theory of infinite dimensional dynamical systems. Retarded functional differential equations are used to illustrate the usefulness of the approach and the limitations of our present knowledge. Author (GRA)

N82-21970# California Univ., Santa Barbara. Inst. for Algebra and Combinatorics.

STUDIES IN NUMERICAL ALGEBRA WITH APPLICATIONS Annual Report, 1 Oct. 1980 - 30 Sep. 1981

Marvin Marcus, M. Goldberg, M. Newman, R. C. Thompson, H. Minc, and E. C. Johnsen 29 Sep. 1981 33 p refs

(Grant AF-AFOSR-0127-79; AF Proj. 2304)

(AD-A110301; AFOSR-81-0883TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Research covered the following topics: (1) generalizations of the Cauchy-Schwarz inequality to determinants; (2) the structure of the set of complex numbers (Ax sub 1, Y sub 1) + ... + (Ax sub r, y sub r) where the inner products (x sub i, x sub j), (Y sub i, Y sub j) and (x sub i, Y sub j) are stipulated, i = 1,...,r; (3) the positive definite property of the A-numerical radius defined by Goldberg and Straus; (4) conditions for two decomposable tensors in a symmetry class to be equal or for a decomposable tensor to be 0; (5) the geometry of the set of numbers (Ax, Y) in which x and y are unit vectors with fixed inner product. Author (GRA)

N82-21971# New York Univ., N. Y. Courant Inst. of Mathematical Sciences.

COMPUTING SOLUTIONS OF THE REDUCED WAVE EQUATION Final Report, 21 Nov. 1979 - 30 Sep. 1981

Cathleen S. Morawetz Sep. 1981 5 p refs

(Contract F49620-79-C-0193)

(AD-A110299; AFOSR-81-0879TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This report summarizes progress made in various numerical experiments made on one dimensional model inverse problems. Author (GRA)

N82-21972# Stanford Univ., Calif. Dept. of Computer Science.

THE CARATHEODORY-FEJER METHOD FOR REAL RATIONAL APPROXIMATION

Lloyd N. Trefethen and Martin H. Gutknecht (Eidgenoessische Technische Hochschule) Oct. 1981 25 p refs Sponsored in part by the Hertz Foundation

(Contract N00014-75-C-1132)

(AD-A110208; STAN-NA-81-15) Avail: NTIS HC A02/MF A01 CSCL 12/1

A 'Caratheodory-Fejer method' is presented for near-best real rational approximation on intervals, based on the eigenvalue (or singular value) analysis of a Hankel matrix of Chebyshev coefficients. GRA

N82-21973# State Univ. of New York at Buffalo. Dept. of Computer Science.

A PRELIMINARY REPORT ON A MULTI-LEVEL LEARNING TECHNIQUE USING PRODUCTION SYSTEMS Interim Report, 1 Jul. 1980 - 30 Jun. 1981

Nicholas V. Findler Nov. 1981 11 p refs

(Grant AF-AFOSR-0220-81)
(AD-A110255; AFOSR-81-0875TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

A generalized production system is described. The rules in it connect causally and stochastically related open and hidden variables. An open variable can be observed and measured at any time whereas the values of a hidden variable can be identified only at certain times. Both the causes and effects can be either open or hidden variables. The objective of the system is to provide sharper and sharper estimates of the values of hidden variables. A multilevel learning mechanism is outlined that leads to better and larger knowledge bases. Author (GRA)

N82-21974# State Univ. of New York at Buffalo. Group for Computer Studies of Strategies.

A NOTE ON COMPUTING THE ASYMPTOTIC FORM OF A LIMITED SEQUENCE OF DECISION TREES Interim Technical Report, 1 Jul. 1980 - 30 Jun. 1981

Nicholas V. Findler, Neal Mazur, and Bede McCall Nov. 1981 44 p refs
(Grant AF-AFOSR-0220-81; AF Proj. 2304)
(AD-A110254; AFOSR-81-0872TR; TR-189; TR-3) Avail: NTIS HC A03/MF A01 CSCL 12/1

It is often desirable to compute the asymptotic form of a limited sequence of decision trees (DT's) after the set of decision variables has reached a stable, constant membership. Such is the case when the DT's characterize the evolving behavior of a learning strategy in the Quasi Optimizer system under development. An algorithm is describing which builds the asymptotic decision tree in breadth first order, node by node, starting at the root. In the course of computing the asymptotic value of a node (that is, its out degree and the limiting points of its subranges), three situations may arise: (1) the computation is possible; (2) the computation seems to be possible but more DT's have to be acquired of the evolving strategy to reach the desired level of statistical significance; (3) the computation is not possible. Author (GRA)

N82-21975# Naval Surface Weapons Center, White Oak, Md. Underwater Systems Dept.

ALGORITHMS FOR THE ESTIMATION OF TIME DELAY AND TIME DELAY RATE Final Report

A. K. Chrysostomou and R. S. Hebbert 1 Aug. 1981 27 p ref
(AD-A110379; NSWC/TR-81-303) Avail: NTIS HC A03/MF A01 CSCL 12/1

The purpose of this report is to present two generalized cross correlation algorithms for the estimation of the time delay and time delay rate parameters. The implementation of these algorithms is done on a CSPI MAP-300 array processor and a PDP 11/34 as the host computer. The performance of the algorithms is evaluated in real time with simulated and real data. Author (GRA)

N82-21976# Michigan Univ., Ann Arbor. Dept. of Mathematics.

NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS Final Report, 1 Jul. 1979 - 30 Sep. 1981

L. Ridgway Scott Nov. 1981 9 p refs
(Contract F49620-79-C-0149; AF Proj. 2304)
(AD-A110302; AFOSR-81-0880TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The report summarizes progress made in several, areas, including: estimates for finite element methods, numerical simulation of nonlinear dispersive waves, numerical models for plasticity, numerical methods for the transport equation, and computation of fluid-flow problems. Author (GRA)

N82-21977*# Wisconsin Univ. - Madison. Mathematics Research Center.

A GENERALIZED CONJUGATE GRADIENT METHOD FOR NON-SYMMETRIC SYSTEMS OF LINEAR EQUATIONS

John C. Strikwerda Oct. 1981 23 p refs
(Contracts NAS1-15810; NAS1-16394;
DAAG29-80-C-0041; Grant NSF MCS-79-27062)
(NASA-CR-164805; NAS 1.26:164805; AD-A110311;
MRC-TSR-2290) Avail: NTIS HC A02/MF A01 CSCL 12/1

A new iterative method is presented for solving non-symmetric linear systems of equations. The method requires that the symmetric of the matrix of the linear system be positive definite, and the method is efficient only if the symmetric part is easily invertible. The method is modeled on the conjugate gradient method for symmetric positive definite systems and has the finite termination property. The results from several numerical experiments are presented and compared with a similar method proposed by Concus, Golub, and Widlund. GRA

N82-21978# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computer Science.

THE ROBIN PROBLEM FOR LAPLACE'S EQUATION

G. T. Symm Sep. 1980 12 p refs
(NPL-DNACS-32/80; ISSN-0143-7348) Avail: NTIS HC A02/MF A01

An application of three subroutines which form the basis of a library program for the solution of Laplace's equation in two dimensions in any simply connected plane domain bounded by straight lines and/or circular arcs subject to Robin boundary conditions, is presented. The direct boundary element method based on Green's third identity is used with piecewise constant approximations to the boundary values. Results of test problems are presented. Author (ESA)

N82-21979# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computer Science.

ON LINEAR SYSTEMS ARISING FROM FINITE DIFFERENCE APPROXIMATIONS TO ELLIPTIC DIFFERENTIAL EQUATIONS

S. Hammarling and J. H. Wilkinson Oct. 1980 22 p refs
(NPL-DNACS-34/80; ISSN-0143-7348) Avail: NTIS HC A02/MF A01

The accuracy of computed solutions of linear systems arising from finite difference approximations to elliptical differential equations is discussed. Simple ordinary differential equations and partial differential equations are studied. Poisson's equations is treated as an example. It is concluded that there is no reason to expect the accuracy of the solutions to vary with the nature of the boundary conditions. In general, the accuracy of the computed solutions fully reflects the condition number of the matrix coefficients. Author (ESA)

N82-21980# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computer Science.

THE USE OF CHEBYSHEV POLYNOMIALS FOR THE PRODUCTION OF SPIRITS TABLES

P. E. M. Curtis and J. G. Hayes Oct. 1980 19 p refs
(NPL-DNACS-35/80; ISSN-0143-7348) Avail: NTIS HC A02/MF A01

The setting up of a table to provide a rapid determination of the dutiable alcohol content of a bulk of spirits of known aloholic strength by volume, for volumes measured at temperatures other than 20 C, is described. The calculations performed are based on a formula of the Organisation Internationale de la Metrologie Lvegale. A computer of modest precision (7 decimals) can be used. A computational method is also given for obtaining alcoholic strength by mass for any given values of density and temperature. The usefulness and advantages of Chebyshev polynominals are demonstrated in these and other calculations. Author (ESA)

N82-21981# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computer Science.

DIRECT VERSUS ITERATIVE METHODS FOR MULTIVARIATE SPLINE FITTING PROBLEMS

M. G. Cox Oct. 1980 14 p refs
(NPL-DNACS-37/80; ISSN-0143-7348) Avail: NTIS HC A02/MF A01

Exponential growth still occurs with functions of compact support, although at a reduced rate. This growth is related to methods of solving the equations defining the coefficients on the basis functions. Operation counts and storage requirements are examined for the least squares solution of an idealized spline fitting problem in several independent variables. The principal conclusions are that iterative methods of solution are faster than direct methods for problems in three or more dimensions, and require less storage space for problems in two or more dimensions. Author (ESA)

N82-21982# Ghent Univ. (Belgium).
APPLICATION OF THE BOUNDARY INTEGRAL EQUATION METHOD TO PLANE ELASTOSTATICS
Frank vanderWeeen (Ghent Univ.) Oct. 1980 34 p refs Presented at Seminar on Machine Mech., Ghent Sponsored by Inst. pour l'Encouragement de la Recherchie Scientifique dans l'Industrie et l'Agriculture
(CRIF-MT-138) Avail: NTIS HC A03/MF A01

An effective numerical treatment of boundary integral equations (BIE) for two dimensional elastostatics is reported on. The industrial applicability of the BIE method, which presents the advantage of reducing the dimensions of the problem by one, at the expense of solving the awkward singular integral equations by sophisticated numerical techniques, is sought. The integral equations are written at the functional nodes of the boundary which is discretized into a number of segments defined by shape functions. Gaussian quadrature formulas are used to integrate the kernel shaped function products over the curved segments. The results of the BIE model, as shown in sample problems, are at least comparable to those obtained by finite element analysis. When predictions for many interior points are required, the computing advantage over the finite element method is reduced. Author (ESA)

N82-21983# Stuttgart Univ. (West Germany). Abt. Datenverarbeitung und Numerik.
COMPARISON OF VARIOUS NONLINEAR OPTIMIZATION PROCEDURES AND APPLICATION TO CURVE FITTING Thesis [VERGLEICH VERSCHIEDENER NICHTLINEARER OPTIMIERUNGSVERFAHREN UND IHRE ANWENDUNG AUF KURVENANPASSUNGEN]
Stefan Sachs Sep. 1980 75 p refs In GERMAN; ENGLISH summary
(IKE-4-97; ISSN-0173-6892) Avail: NTIS HC A04/MF A01

Different methods for optimization of a nonlinear regression through a number of data points are discussed and an optimized computer program is presented, giving the statistical characterization and the error bars of the resulting fit. Various direct methods for optimization were investigated. It is concluded that the advantages of a direct method do not balance the greater stability offered by the Gauss-Newton algorithm, modified as suggested by Marquardt. The program permits selection out of seven regression functions by calculating the correlation coefficients, the standard deviation, range and distribution of residues, and the chi test. Confidence intervals are also included and special attention is paid to their reliability in particular in view of extrapolation. Author (ESA)

N82-21984# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
CONTROLLED INVARIANCE FOR NONLINEAR SYSTEMS
Henk Nijmeijer (Dutch Nonlinear Systems Group) and Arjan vanderSchaft (Dutch Nonlinear Systems Group) Feb. 1981 32 p refs Submitted for publication
(MC-BW-136/81) Avail: NTIS HC A03/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 4,20

Necessary and sufficient conditions were derived for (A,B) invariance for nonlinear systems differential x equals f(x,u). A coordinate-free way of defining these equations is shown. The results obtained generalize and elucidate already known results about defined differential x systems. With the aid of this theorem the disturbance decoupling problem is readily solved. The concept of a connection on a fiber bundle is introduced and related to controlled invariance. A direct differential geometric interpretation of the concept of controlled invariance and the derived conditions is given. Author (ESA)

N82-21985# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
COMPUTER AIDED COMPLEXITY CLASSIFICATION OF COMBINATORIAL PROBLEMS
B. J. Lageweg, E. L. Lawler (Calif. Univ., Berkeley), J. K. Lenstra, and A. H. G. RinnooyKan (Erasmus Univ.) Mar. 1981 16 p refs Submitted for publication
(Grants NSF MCS-78-20054; NATO-9.2.02-(SRG.7))
(MC-BW-137/81) Avail: NTIS HC A02/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 3,15

A computer program which is used to maintain a record of the known complexity results for a class of 4536 machine scheduling problems is described. The input consists of a listing of known easy problems and a listing of known 'hard' problems. The program employs the structure of the problem class to determine the implications of these results. The output provides a listing of essential results in the form of maximal easy and minimal hard problems as well as listings of minimal and maximal open problems, which are helpful in the direction of future research. The application of the program to a restricted class of 120 single-machine problems is demonstrated. Possible refinements and extensions are suggested. The problem of determining the minimum number of results needed to resolve the status of all remaining open problems in such a complexity classification is shown to be itself hard. Author (ESA)

N82-21986# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
NONLINEAR SYSTEMS AND NONLINEAR ESTIMATION THEORY
R. W. Brockett (Harvard Univ., Cambridge, Mass.) Mar. 1981 40 p refs Submitted for publication
(MC-BW-139/81) Avail: NTIS HC A03/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 5,25

The estimation problem for a class of diffusion models is presented. Lie algebra is defined and several examples are given. Controllability and observability Lie algebras are demonstrated. Concepts of nonlinear system theory and Lie algebra theory are used to analyze the unnormalized conditional density equation, particularly by use of Wei-Norman equations in the representation of solutions of differential equations. Examples of finite dimensional filter systems are treated. Author (ESA)

N82-21987# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
CONTROLLABILITY DISTRIBUTIONS FOR NONLINEAR CONTROL SYSTEMS
Henk Nijmeijer Apr. 1981 15 p refs
(MC-BW-140/80) Avail: NTIS HC A02/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 3,15

A special class of controlled invariant subspaces, controllability subspaces, can be used in the structure analysis of linear systems, for example in the investigation of stabilization, decomposition, and noninteractive control. The notion of controlled invariance is related to a notion of controllability for nonlinear control systems. A very structured description of nonlinear systems is derived by means of the 'linear' ideas of a subsystem and a quotient system. Author (ESA)

N82-21988# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
INTERPOLATION OF WEIGHTED SPACES OF DIFFERENTIABLE FUNCTIONS ON R SUPERSCRIPT d
Joergen Loefstroem 1981 37 p refs
(CTH-Math-1981-05) Avail: NTIS HC A03/MF A01

The interpolation spaces between Sobolev spaces, and between two of their generalizations, are characterized by the real and complex interpolation methods. Basic results on translation invariant operations on weighted L suffix p-spaces are included. The Stein-Weiss interpolation theorem is used when considering weighted Lebesgue spaces. For interpolation of spaces of differentiable functions (Sobolev and Besov spaces), only weight functions which are powers of polynomials are considered. Author (ESA)

N82-21989# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computer Science.
THE NUMERICAL SOLUTION OF THE LYAPUNOV EQUATION
S. J. Hammarling Aug. 1981 34 p refs
(NPL-DNACS-49/81; ISSN-0143-7348) Avail: NTIS HC A03/MF A01

The equation A super H + XA = -C, C = super H (the Liapunov equation) is discussed. The Bartels-Stewart algorithm is discussed and a variant to obtain the Cholesky factor U directly without first finding X is proposed. In the case where A is normal, the Kronecker product form of the Liapunov equation, and the sensitivity to perturbations of the Liapunov equation

are discussed. The discrete time, and the implicit Liapunov equations are treated. Author (ESA)

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N82-21990# Dayton Univ., Ohio. Research Inst.
ESTIMATING PRECENTILES OF SKEWED DATA
Medhat Korna Wright-Patterson AFB, Ohio AMRL Nov. 1981 34 p refs
(Contract F33615-78-C-0507; AF Proj. 7184)
(AD-A110323; UDR-TR-81-43; AFAMRL-TR-81-132) Avail: NTIS HC A03/MF A01 CSCL 12/1

This report documents the experimental and theoretical approaches taken in developing the Nonparametric Percentile (Program NPPCTL) computer program. The developed computer program computes the percentile estimates of the sample data using both the Gaussian method and the nonparametric method described in this report. The report also describes the basic equations for the nonparametric method and provides a guide to the use of the computer program (NPPCTL) in addition to the source code listing. Author (GRA)

N82-21991# State Univ. of New York at Buffalo. Dept. of Computer Science.
MORPH-FITTING. AN EFFECTIVE TECHNIQUE OF APPROXIMATION Interim Technical Report, 1 Jul. 1980 - 30 Jun. 1981
Nicholas V. Findler and Ernesto Morgado Nov. 1981 37 p refs
(Grant AF-AFOSR-0220-81; AF Proj. 2304)
(AD-A110253; AFOSR-81-0893TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

An algorithm was developed and programmed which fits a minimum number of basic patterns, morphs, to a sequence of datapoints. The dependent variable is given as a scalar value; the independent variable is distance like or time like and can represent continuous or discrete values or an event counter. The morphs fitted are an indefinite number of occurrences of trends (straight lines), step functions, and sudden changes (peaks of sort duration). Delay functions span over periods characterized by uniterpretable events. A useful by product of the investigation is a set of optimum decision rules concerning the boundary points between sequential regression functions. Author (GRA)

N82-21992# Naval Postgraduate School, Monterey, Calif.
THE ONE-SAMPLE K-S TEST: TI-59 PROGRAMS FOR DISCRETE AND CONTINUOUS RANDOM VARIABLES M.S. Thesis
Douglas Warren Brown Mar. 1981 73 p refs
(AD-A110378) Avail: NTIS HC A04/MF A01 CSCL 12/1

The Kolmogorov-Smirnov (K-S) goodness-of-fit test is a nonparametric test if the random variable is continuous. If the random variable is discrete the K-S test is not nonparametric. Two programs for the TI-59 programmable calculator are presented, 'Continuous K-S' and 'Discrete K-S'. They are designed to conduct a K-S test and display the significance level. User instructions and several sample problems are presented. Use of the 'hidden registers' in the TI-59 is discussed. The hidden registers are used extensively in the program Discrete K-S. Author (GRA)

N82-21993# Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
THE PROBABILISTIC REALIZATION PROBLEM FOR FINITE DIMENSIONAL GAUSSIAN RANDOM VARIABLES
J. H. vanSchuppen May 1981 8 p refs Presented at European Conf. on Circuit Theory and Design, The Hague, 1981 Submitted for publication
(MC-BW-141/81) Avail: NTIS HC A02/MF A01; Stichting Mathematisch Centrum, Amsterdam FL 3,15

A classification of all sigma-algebras that make two given sigma-algebras conditionally independent is given for the case that the sigma-algebras are generated by finite dimensional Gaussian random variables. The approach is a mixture of probabilistic and geometric analysis. The use of a Hilbert space framework is insufficient for the problem. The restriction to sigma-algebras generated by finite dimensional Gaussian, random variables allows a more explicit classification to be obtained. Author (ESA)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

No abstracts in this category.

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N82-21994# Technische Hogeschool, Delft (Netherlands).
ORTHOGONAL FILTERS Ph.D. Thesis
Edmond Deprettere 13 Oct. 1981 112 p refs
Avail: NTIS HC A06/MF A01

Multivariate transfer function synthesis and realization for the stationary discrete time case are studied. Filter realizations and realization structures are emphasized and procedures and algorithms are developed. The structures are highly modular, with delay free interconnectable modules and orthogonal model realizations. The construction procedures provide recursive and norm preserving algorithms, extracting modules from primary data in some optimal way. The theory of lossless and j-lossless embedding is applied. S.L.

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N82-21995# Joint Publications Research Service, Arlington, Va.
CHINA REPORT. SCIENCE AND TECHNOLOGY, NO. 153
18 Mar. 1982 57 p refs Transl. into ENGLISH of various Chinese articles
(JPRS-80348) Avail: NTIS HC A04/MF A01

Donor generation in p-type CZ Si, commonly used for LSI manufacturing, is discussed. A brief overview of the antinuclear radiation electronics field is presented. Other topics include: the successful flight of an electromagnetic rocket; industrial laser applications; and the applications of materials that are treated with radiation. For individual titles, see N82-21996 through N82-21997.

N82-21996# Joint Publications Research Service, Arlington, Va.
NEW DONOR IN ANNEALED SILICON STUDIED **c76**
Xu Zhenjia, Sun Bokang, Wang Wannian, Zhang Zehua, Liu Jiangxia, and He Guangping *In its* China Rept.: Sci. and Technol., No. 153 (JPRS-80348) 18 Mar. 1982 p 6-15 refs Transl. into ENGLISH from Acta Electron. Sinica (Beijing), no. 6, 1981 p 58-63 (For primary document see N82-21995 12-70)
Avail: NTIS HC A04/MF A01

A new donor is confirmed to be closely correlated with oxygen impurity as is the thermal donor formed in 450 C annealing. However, the new donor differs greatly in annealing behavior from the thermal donor. The generation rate of new donor is slower than that of thermal donor, and the maximum new donor concentration after annealing for a long time (100 hrs) is about 10 to the 15th power per cu cm. Impurity carbon promotes the generation of the new donor. The mechanism of new donor generation is briefly discussed. T.M.

N82-21997# Joint Publications Research Service, Arlington, Va.
ANTINUCLEAR RADIATION ELECTRONICS STUDIED c73
Lai Zuwu *In its* China Rept.: Sci. and Technol., No. 153 (JPRS-80348) 18 Mar. 1982 p 16-32 refs Transl. into ENGLISH from Acta Electron. Sinica (Beijing), no. 6, 1981 p 87-95 (For primary document see N82-21995 12-70)
Avail: NTIS HC A04/MF A01

Since the electronic devices and systems are quite sensitive to nuclear radiation, they must be well designed and hardened in order to operate and survive in space and near the nuclear reactor or the explosion of a nuclear weapon. An outline of antinuclear radiation electronics is presented. It includes three major categories: radiation effects (to make radiation tests and to evaluate the survivability); damage mechanism (to study the damage mechanism and to determine the failure modes); and nuclear hardening (to make the hardening design and fabrication techniques. T.M.

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N82-21998*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A PRELIMINARY COMPARISON BETWEEN THE SR-3 PROPELLER NOISE IN FLIGHT AND IN A WIND TUNNEL
James H. Dittmar and Paul L. Lasagna 1982 14 p refs Presented at the 103rd Meeting of the Acoust. Soc. of Am., Chicago, 27-30 Apr. 1982
(NASA-TM-82805; E-1144; NAS 1.15:82805) Avail: NTIS HC A02/MF A01 CSCL 20A

The noise generated by supersonic-tip-speed propellers is addressed. Models of such propellers were tested for acoustics in the Lewis 8-by-6-foot wind tunnel. One of these propeller models, SR-3, was tested in flight on the Jetstar airplane and noise data were obtained. Preliminary comparisons of the maximum blade passing tone variation with helical tip Mach number taken in flight with those taken in the tunnel showed good agreement when corrected to the same test conditions. This indicated that the wind tunnel is a viable location for measuring the noise of these propeller models. Comparisons of the directivities at 0.6 and 0.7 axial Mach number showed reasonable agreement. At 0.75 and 0.8 axial Mach number the tunnel directivity data fell off more towards the front than did the airplane data. A possible explanation for this is boundary layer refraction which could be different in the wind tunnel from that in flight. This may imply that some corrections should be applied to both the airplane and wind tunnel data at the forward angles. At and aft of the peak noise angle the boundary layer refraction does not appear to be significant and no correction appears necessary. M.G.

N82-21999*# Kansas Univ. Center for Research, Inc., Lawrence. Flight Research Lab.
STUDY OF NOISE REDUCTION CHARACTERISTICS OF COMPOSITE FIBER-REINFORCED PANELS, INTERIOR PANEL CONFIGURATIONS, AND THE APPLICATION OF THE TUNED DAMPER CONCEPT Progress Report, 1 Oct. 1981 - 28 Feb. 1982
Jaap Lameris, Scott Stevenson, and Barry Streeter Mar. 1982 163 p refs
(Contract NCC1-6)
(NASA-CR-168745; NAS 1.26:168745; KU-FRL-417-18) Avail: NTIS HC A08/MF A01 CSCL 20A

The application of fiber reinforced composite materials, such as graphite epoxy and Kevlar, for secondary or primary structures developing in the commercial airplane industry was investigated. A composite panel program was initiated to study the effects of some of the parameters that affect noise reduction of these panels. The fiber materials and the ply orientation were chosen to be variables in the test program. It was found that increasing the damping characteristics of a structural panel will reduce the vibration amplitudes at resonant frequencies with attendant reductions in sound reduction. Test results for a dynamic absorber, a tuned damper, are presented and evaluated. M.D.K.

N82-22000# Technische Hogeschool, Delft (Netherlands).
SCATTERING OF TRANSIENT ACOUSTIC WAVES IN FLUID AND SOLIDS Ph.D. Thesis
Gerard Cornelis Herman 22 Dec. 1981 190 p refs Sponsored by the Netherlands Organization for the Advancement of Pure Research (Z.W.O.)
Avail: NTIS HC A09/MF A01

The linearized theory of the three-dimensional scattering of transient acoustic waves in fluids and solids by obstacles of finite interest is discussed. Special attention is devoted to the direct time-domain analysis and its implementation, although Fourier inversion of analytically obtained frequency-domain results is occasionally used as a check on the numerically obtained time-domain results. L.F.M.

N82-22001# Materials Research Labs., Melbourne (Australia).
APPROACHES TO A QUANTITATIVE ANALYTICAL DESCRIPTION OF LOW FREQUENCY SOUND ABSORPTION IN SEA WATER
Daniel J. Whelan Sep. 1980 40 p refs
(MRL-R-791) Avail: NTIS HC A03/MF A01

The absorption of sound in sea water at low frequency (1-100 kHz) and intermediate frequency (50-500 kHz) ranges was defined by a series of relaxation phenomena, each of which was described mathematically by a Debye relationship. Below 5 kHz, the principal absorption mechanism was attributed to borate and magnesium/carbonate interactions, while in the range 5 to 50 kHz the absorption arose from magnesium sulphate ion pair formation in sea water. The dependence of the various relaxation modes on oceanographic variables is outlined in quantitative terms based on results from deep ocean sound channel experiments and laboratory experiments. M.D.K.

N82-22002# Deft Labs., Inc., Syracuse, N.Y.
ACOUSTO-OPTIC TECHNOLOGY FOR TOPOGRAPHIC FEATURE EXTRACTION AND IMAGE ANALYSIS Final Technical Report, Oct. 1979 - Feb. 1981
Alan L. Moyer Mar. 1981 210 p refs
(Contract DAAK70-79-C-0160)
(AD-A110322; Rept-0102-A002; ETL-0256) Avail: NTIS HC A10/MF A01 CSCL 20/1

This report contains all findings of the acousto-optic technology study for feature extraction conducted by Deft Laboratories Inc. for the U.S. Army Engineer Topographic Laboratories. The objective of this program was to develop, analyze and evaluate theoretical concepts and strategies for topographic feature extraction and image analysis using acousto-optic (A-O) technology. A conclusion of this study was that A-O devices are potentially capable of implementing the feature extraction prefilter function very efficiently. Since the prefilter is the most computational intensive portion of the feature extraction process this is a significant result. The best application of A-O devices is in the implementation of transform-based prefilter algorithms. Under this contract transform-based algorithms were identified and developed which are invariant to feature translation, rotation and scale. This invariance is highly desirable since it reduces the number of distinct feature signatures which must be processed by the decision processor. GRA

N82-22003# Catholic Univ. of America, Washington, D.C. Human Performance Lab.
DISCRIMINATION AND IDENTIFICATION OF ACOUSTIC TRANSIENT PATTERNS
James A. Ballas and James H. Howard, Jr. 31 Aug. 1981 34 p refs
(Contract N00014-79-C-0550; NR Proj. 196-159)
(AD-A110421; TR-ONR-81-17) Avail: NTIS HC A03/MF A01 CSCL 05/1

The relation between the discrimination and the identification of acoustic patterns can be addressed psychophysically or cognitively. The psychophysical approach predicts a monotonic relationship between performance on the two tasks. Cognitively, the relationship may depend upon the type of structure encoded from the patterns. Structure based upon similarities in runs could enhance discrimination but degrade identification. Hierarchical

structural encoding might enhance both tasks. The relationship was investigated in three dual task experiments. In one experiment, trial and error learning was used whereas in the other two, observation of positive examples was used. All three experiments indicated that discrimination was superior to identification, and that the concurrent identification task improved discrimination performance above what has been obtained in single task discrimination studies. The effects of structure in the two tasks were equivocal but implied that the type of structured encoding is important and may be influenced by the procedure used to acquire the patterns. GRA

N82-22004# Catholic Univ. of America, Washington, D.C. Human Performance Lab.

LISTENER DESCRIPTIONS OF ISOLATED AND PATTERNED ACOUSTIC TRANSIENTS

James A. Ballas, James H. Howard, Jr., and Christopher Kolm 30 Nov. 1981 29 p refs

(Contract N00014-79-C-0550; NR Proj. 196-159)

(AD-A110422; TR-ONR-81-19) Avail: NTIS HC A03/MF A01 CSCL 05/1

A three-phase experiment was conducted to assess listeners' ability to recognize and identify environmental acoustic sounds. The first phase was a free identification of ten short duration recordings of real-world events. The second phase was a free identification of five sequences composed of a subset of these ten transients. These sequences were intended to be meaningful, representing the sounds that could be produced by opening water or steam valves. The third phase was a forced identification of the ten transients using a checklist of descriptors. The results showed that while some types of sounds were identified correctly by most listeners, others were confused and rarely identified correctly. Several metallic sounds were often confused semantically even though they were quite distinct perceptually. The identification of patterns was found to depend upon both the salience of the individual sounds in the pattern and the semantic relationship between the sounds. Finally, it was demonstrated that signal processing errors can have perceptually meaningful effects. An error in processing one of the ten sounds produced a signal which was interpreted consistently by most listeners, but in a manner which had little semantic relationship to the actual event which had been recorded. Author (GRA)

N82-22005# Rolls-Royce Ltd., Derby (England). Dept. of Noise Systems.

STANDARDS IN AIRCRAFT NOISE CERTIFICATION

L. R. Bentley 1980 7 p Presented at NPL Conf. on Std. in Acoustics, Teddington, Engl., 8 Oct. 1980

(PNR-90052) Avail: NTIS HC A02/MF A01

The development of the International Civil Aviation Organization and Federal Aviation Agency noise strandards is reviewed and compared. The assessment of the effectiveness of standards by on-site measurements by different organizations, and by distribution of magnetic tapes of measurements is mentioned. The development of root mean square detectors employing digital techniques has simplified the standardization of detector performance. Atmospheric attenuation effects on certification measurements are outlined and problems caused by reflected sound waves received by the microphone located at the mandatory 1.2 m height are cited. Author (ESA)

N82-22006# Forschungsinstitut fuer Hochfrequenzphysik, Werthhoven (West Germany).

SYSTEM GAIN FUNCTION CALCULATION FOR ACOUSTIC ARRAYS USING RAY OPTICAL METHODS [STRAHLENOPTISCHE BERECHNUNG DER SYSTEM-GEWINN-FUNKTION AKUSTISCHER ANTENNENGRUPPEN]

O. Schmid and C. vonWinterfeld Nov. 1980 40 p refs In GERMAN; ENGLISH summary

(Contracts BMVg-GF-79/80; I/RF-37/A-0003/A-1303)

(Rept-10/80) Avail: NTIS HC A03/MF A01

The gain function of an acoustic antenna array is calculated with respect to waves, propagating from a point source into an homogeneous medium (water) with a sinusoidally varying surface of known phase statistics, treating antenna and environment as one system. An asymptotic solution (high frequency approximation) is developed. For distances of several wavelengths between the array and the surface of the medium, the propagation mechanism is described by a geometrical theory of diffraction applied to scalar waves. The gain function of the antenna together with the reflecting surface is obtained from the cross correlations of the resulting sound fields of each antenna element.

Author (ESA)

N82-22007# Royal Aircraft Establishment, Farnborough (England).

SOME APPLICATIONS OF HARTMANN-TYPE SOURCES IN AIRCRAFT NOISE RESEARCH

T. A. Holbeche and R. W. Jeffrey Nov. 1980 18 p refs Presented at Spring Meeting of the Inst. of Acoustics, Nottingham, England, Mar. 1975

(RAE-TM-AERO-1877; BR77146) Avail: NTIS HC A02/MF A01

Inflight shielding experiments were performed with a slender delta research aircraft fitted with needle stabilized generators having 19mm diameter driving jets operated from the high pressure turbine of the aircraft engine. Acoustic power output is 1 kW and consists of a strong fundamental 2.8 kHz tone and higher harmonics, discernible above engine noise. Comparative wind tunnel experiments employed quarter-scale versions built to match the tunnel model and these operated at 11 kHz, the output level being well above tunnel backgroung noise. Calibration in an anechoic room shows output to be steady and nearly omnidirectional. Author (ESA)

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N82-22008# Brookhaven National Lab., Upton, N. Y.

RESEARCH AT THE BNL TANDEM VAN DE GRAAF FACILITY, 1980

1 Mar. 1981 126 p refs

(Contract DE-AC02-76CH-00016)

(DE82-003259; BNL-51426) Avail: NTIS HC A07/MF A01

Research programs at the Brookhaven Van de Graaff accelerator facility are summarized. Major accomplishments of the laboratory are discussed including quasielastic reactions, high-spin spectroscopy, yrast spectra, fusion reactions, and atomic physics. The outside user program at the Laboratory is discussed. Research proposed for 1981 is outlined. DOE

N82-22009# Lehigh Univ., Bethlehem, Pa.

ENERGY LOSSES OF POSITIVE AND NEGATIVE CHANNELED PARTICLES

M. A. Hasan, A. S. Kanofsky, R. Allen, C. R. Sun (State Univ. of N.Y., Albany), W. M. Gibson (State Univ. of N.Y., Albany), L. J. Kim (State Univ. of N.Y., Albany), G. O. Williams (State Univ. of N.Y., Albany), R. A. Carrigan, Jr. (Fermi National Accelerator Lab., Batavia, Ill.), B. L. Chrisman (Fermi National Accelerator Lab., Batavia, Ill.), T. E. Toohig (Fermi National Accelerator Lab., Batavia, Ill.) et al 1981 44 p refs

(Contract DE-AS02-76ER-02894)

(DE82-003562; DOE/ER-02894/2) Avail: NTIS HC A03/MF A01

The energy loss of particles channeled through a 2 cm thick Ge crystal at energies of 35, 100 and 250 GeV are discussed. An outline is presented of the theory of energy loss and how it applies to channeled particles, the experimentally determined parameters of Lindhard's theory, and the minimum energy loss values. These are compared with the theory of Golovchencko and Esbensen. DOE

N82-22010# Kansas State Univ., Manhattan. Atomic and Nuclear Science Lab.

ATOMIC PHYSICS WITH HIGHLY IONIZED IONS Progress Report, 1 Jun. 1980 - 31 May 1981

P. Richard Jun. 1981 33 p refs

(Contract DE-AS02-76ER-02753)

(DE82-002757; DOE/ER-02753/147) Avail: NTIS HC A03/MF A01

Research accomplishments for a program are summarized.

Research consisted of the study of the following processes: K-ionization, K-shell to K-shell electron transfer and double K-shell to K-shell electron transfer for systems of varying charge asymmetry in high energy high charge (HEHQ) collisions, the capture of loosely bound electrons to Rydberg states of highly ionized spectra, the excitation of, ionization and capture to well-defined states of few electron ions, the calculation of the structure and formation of the highly ionized states that are observed through deexcitation processes, and single and multiple electron transfer, ionization and transfer ionization in low energy high charge (LEHQ) collisions. DOE

N82-22011# Harvard Coll. Observatory, Cambridge, Mass.
THEORETICAL STUDIES OF HIGHLY-IONIZED SPECIES Progress Report, 1 Mar. 1981 - 28 Feb. 1982
A. Dalgarno Aug. 1981 27 p
(Contract DE-AC02-76ER-02887)
(DE82-002924; DOE/ER-02887/3) Avail: NTIS HC A03/MF A01

Cross sections for the charge transfer of N(2) and C(3) ions in collisions with atomic hydrogen at energies up to eV were calculated by a diabatic molecular formulation of the scattering problems. The emission characteristics of the end products of charge transfer recombination and to their utility as a diagnostic probe of the plasma environment are noted. An alternative computation procedure is developed which is equivalent to a unitarized second order distorted wave approximation. The distorted wave calculations include cross sections for the excitation and deactivation of metastable states of multiply charged ions by impact of protons and singly charged helium ions. DOE

N82-22012# College of William and Mary, Williamsburg, Va. Dept. of Physics.
NEGATIVE-ION DETACHMENT CROSS SECTIONS Progress Report
R. L. Champion and L. D. Doverspike 26 Aug. 1981 44 p refs
(Contract DE-AS05-79ER-10371)
(DE81-030331; DOE/ER-10371/3) Avail: NTIS HC A03/MF A01

The various aspects of the collisional detachment of negative ions by atoms and molecules were studied for energies ranging from below the threshold for detachment up to several hundred eV. Low collision energies is based primarily upon features of the intermolecular potentials for the negative ion atom reactants. For the more simple reactants there are theoretical approaches which have been used to describe the dynamics of the discrete continuum interaction associated with direct detachment. It is shown that direct detachment almost always dominates the inelastic scattering in collisions of negative ions with atoms or molecules. DOE

N82-22013# Erevan Inst. of Physics (USSR).
SIMPLE COMPARISON BETWEEN THE YIELDS OF VARIOUS TYPES OF RADIATION OF ELECTRONS
K. A. Ispirian and G. Z. Zazian 1980 15 p refs
(EFI-395(2)-80) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The special distribution of production of photon beams in the energy interval h/2(LC OMEGA) (NU)=1 keV-100 MeV by electrons with energies E=5; 1 and 0.1 GeV were calculated by using simple expressions for various radiation mechanisms. The approximate yields at various electron sources are given. In the presence of inflation of radiation formulae the given plots can help for eye-guide estimate of the usefulness of the given type radiation in the given photon energy region. DOE

N82-22014# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany). Lehrsfuhl fuer Angewandte Mechanik und Stroemungsphysik.
INVESTIGATIONS OF THE VIBRATIONAL AND ROTATIONAL EXCITATION OF N2, CO, NO, O2, CO2, CH4, CF4 AND SF6 DURING COLLISION WITH PROTONS AND DEUTERONS AT AN ENERGY OF 9.8 eV Ph.D. Thesis - Georg-August Univ. [UNTERSUCHUNGEN ZUR VIBRATIONS- UND ROTATIONSANREGUNG VON N2, CO, NO, O2, CO2, CH4, CF4 UND SF6 BEIM STOSS MIT PROTONEN UND DEUTERONEN VON 9,8 eV ENERGIE]
Uwe Gierz Jul. 1980 207 p refs In GERMAN
(MPIS-9/1980; ISSN-0436-1199) Avail: NTIS HC A10/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 32,70

Inelastic collision processes of the class H(+) + AB(0,0) yields H(+) + AB(J,v) + Delta (translation energy), with (J,v) the excited state, were studied experimentally. The measurements show varying results, in such a way that an unified interpretation is impossible. The strong vibrational excitation of O2 is characteristic. A series of models that deal with energy transmission processes are discussed. Only for NO and O2 do measurements agree, at least qualitatively, with theoretical predictions at hand. Trajectory calculations lead only in rare cases to usable results. Better calculation methods for the systems considered are called for.
Author (ESA)

N82-22015# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany).
PRODUCTION OF HADRONS IN CHARGED-CURRENT NEUTRINO AND ANTI-NEUTRINO REACTIONS
Norbert Schmitz Oct. 1981 31 p refs Presented at 1981 Intern. Symp. on Lepton and Photon Interactions at High Energies, Bonn, 24-29 Aug. 1981
(MPI-PAE/Exp-El-96) Avail: NTIS HC A03/MF A01

The state of the art in hadron production measurement from bubble chamber experiments is summarized. Upsilon and upsilon super bar scattering on neutrons are investigated. The quark parton model works successfully and explains the main features of upsilon N and upsilon sup bar N scattering. For multiplicities, many similarities between upsilon N and upsilon sup bar N scattering and nondiffractive hadron-hadron scattering are observed. The fragmentation functions of quarks and diquarks were measured. The main properties of fragmentation functions are in agreement with the quark parton model. Contributions from higher twists seem to be small, but more accurate data at high z and more detailed analyses are needed. The quantum chromodynamics predicted broadening of the p sub T distribution in the forward hemisphere is clearly seen. A small subsample of events are planar and might have a three jet structure, beyond simple p sub t balance. Author (ESA)

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N82-22016*# Boeing Aerospace Co., Seattle, Wash.
ANALYSIS OF SPACE SYSTEMS FOR THE SPACE DISPOSAL OF NUCLEAR WASTE FOLLOW-ON STUDY. VOLUME 1: EXECUTIVE SUMMARY Final Report
1982 22 p 2 Vol.
(Contract NAS8-33847)
(NASA-CR-161991; NAS 1.26:161991; D180-26777-1; DPD-609; DR-4) Avail: NTIS HC A02/MF A01 CSCL 18G

The impact on space systems of three alternative waste mixes was evaluated as part of an effort to investigate the disposal of certain high-level nuclear wastes in space as a complement to mined geologic repositories. A brief overview of the study background, objectives, scope, approach and guidelines, and limitations is presented. The effects of variations in waste mixes on space system concepts were studied in order to provide data for determining relative total system risk benefits resulting from space disposal of the alternative waste mixes. Overall objectives of the NASA-DOE sustaining-level study program are to investigate space disposal concepts which can provide information to support future nuclear waste terminal storage programmatic decisions and to maintain a low level of research activity in this area to provide a baseline for future development should a decision be made to increase the emphasis on this option. R.J.F.

N82-22017*# Boeing Aerospace Co., Seattle, Wash.
ANALYSIS OF SPACE SYSTEMS FOR THE SPACE DIS-

POSAL OF NUCLEAR WASTE FOLLOW-ON STUDY. VOLUME 2: TECHNICAL REPORT Final Report
1982 191 p 2 Vol.
(Contract NAS8-33847)
(NASA-CR-161992; NAS 1.26:161992; D180-26777-2; DPD-609; DR-4) Avail: NTIS HC A09/MF A01 CSCL 18G

The space option for disposal of certain high-level nuclear wastes in space as a complement to mined geological repositories is studied. A brief overview of the study background, scope, objective, guidelines and assumptions, and contents is presented. The determination of the effects of variations in the waste mix on the space systems concept to allow determination of the space systems effect on total system risk benefits when used as a complement to the DOE reference mined geological repository is studied. The waste payload system, launch site, launch system, and orbit transfer system are all addressed. Rescue mission requirements are studied. The characteristics of waste forms suitable for space disposal are identified. Trajectories and performance requirements are discussed. R.J.F.

N82-22018# Westinghouse Electric Corp., Mercury, Nev. Advanced Energy Systems Div.
COMMERCIAL WASTE AND SPENT FUEL PACKAGING PROGRAM
A. R. Hakl Oct. 1981 70 p refs
(Contract DE-AC08-80NV-10061)
(DE82-004692; DOE/NV-10061/9) Avail: NTIS HC A04/MF A01

Nuclear waste storage investigations are discussed. Completion of the first fuel exchange in the Spent Fuel Test - Climax program is described. Plasma arc welder development is discussed. The modification and qualification of a canister cutter, the installation and activation of a remote area monitor, a constant air monitor, and an alpha/beta/gamma counting system is described. Also discussed was qualification of grapples required to handle pressurized water reactor or boiling water reactor fuel and high level waste (HLW) logs; data acquisition from the 3 kilowatt soil temperature test, 2 kw fuel temperature test, and 2 kw drywell test; calorimetry of the fuel assembly used in the fuel temperature test; evaluation of moisture accumulation in the drywells and recommendations for proposed changes; revision of safety assessment document to include HLW log operations; preparation of quality assurance plan and procedures; development and qualification of all equipment and procedures to receive, handle and encapsulate both the HLW log and spent fuel for the basalt waste isolation program/near surface test facility program; preliminary studies of both the requirements to perform waste packaging for the test and evaluation facility, and a cask storage program for the DOE Interim Spent Fuel Management program; and remote handling operations on radioactive source calibration in support of other contractors. DOE

N82-22019# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
LONG-TERM HIGH-LEVEL WASTE TECHNOLOGY Composite Quarterly Technical Report, Jan. - Mar. 1981
W. R. Corman Aug. 1981 130 p refs
(Contract DE-AC09-76SR-00001)
(DE82-000302; DP-81-157-1) Avail: NTIS HC A07/MF A01

Work performed at sites to immobilize high-level radioactive wastes is described. Program management and support with subtasks of management and budget, environmental and safety assessments, waste preparation, storage or disposal; waste retrieval, separation and concentration are discussed. Waste fixation and characterization, process and equipment development, final handling, canister development and characterization and onsite storage or disposal are also reported. Event trees defining possible accidents were completed in a safety assessment of continued in-tank storage of high-level waste. Two low-cost waste forms (tailored concrete and bitumen) were investigated as candidate immobilization forms. Comparative impact tests and leaching tests were also conducted on glasses, ceramics, and concretes. A process design description was written for the tailored ceramic process. M.D.K.

N82-22020# Department of Energy, Mines and Resources, Ottawa (Ontario). Mining Research Labs.
GEOLOGICAL DISPOSAL OF HIGH-LEVEL RADIOACTIVE WASTES
D. F. Coates, G. Larocque, and L. Geller 1980 23 p
(CANMET-79-29) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The problem of safe disposal of various types of radioactive wastes from nuclear power plants is discussed. Mining waste and mill tailings containing toxic radium are produced in large quantities. It is believed about 80 million tons have already accumulated at Elliot Lake, Ontario, alone and that this may increase by the year 2000 to several hundred million tons. These tailings are in bulk but relatively low in radioactivity. Wastes from nuclear generating stations, on the contrary, are highly radioactive but relatively small in volume. A brief overview of how electricity is generated by means of nuclear power, and reasons which render safe disposal of high-level nuclear wastes a particularly difficult and multifaceted problem are discussed. It is suggested that under Canadian conditions deep underground burial of these wastes in mined-out facilities in igneous rocks is the most acceptable solution. M.D.K.

N82-22021# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Raumfahrt.
DEVELOPMENT OF SEPARATOR ELEMENTS: BUNDLE GUIDE TUBES 0.05 mm; OVERALL BUNDLE DIAMETER 66 mm Final Report. [ENTWICKLUNG VON TRENNELEMENTEN MIT EINFACH-UMLENKUNG, R = 0,05 mm UND 66 mm DURCHMESSER]
W. Brunner and P. Bichler 15 Sep. 1980 32 p In GERMAN
(MBB-UR-449/80-OE) Avail: NTIS HC A03/MF A01

Compact separator elements for uranium enrichment using the separator jet process were developed and manufactured. The separator elements are based on a previous design. The single-tube diameter is reduced while the jet geometry remains unchanged. For production purposes, manufacturing and tolerancing procedures were revised and adapted. Author (ESA)

N82-21997# Joint Publications Research Service, Arlington, Va.
ANTINUCLEAR RADIATION ELECTRONICS STUDIED
Lai Zuwu *In its* China Rept.: Sci. and Technol., No. 153 (JPRS-80348) 18 Mar. 1982 p 16-32 refs Transl. into ENGLISH from Acta Electron. Sinica (Beijing), no. 6, 1981 p 87-95 (For primary document see N82-21995 12-70)
Avail: NTIS HC A04/MF A01

74 OPTICS

Includes light phenomena.

N82-22022# Technische Hogeschool, Delft (Netherlands).
AN ULTRA-SENSITIVE INSTRUMENT FOR COLLISION ACTIVATED DISSOCIATION MASS SPECTROMETRY WITH HIGH MASS RESOLUTION Ph.D. Thesis
Gerardus Jozef Louter 23 Feb. 1982 113 p refs Sponsored by the Netherlands Organization for the Advancement of Pure Research (ZWO) Submitted for publication
Avail: NTIS HC A06/MF A01

An extensive description of the double stage Mass Spectrometer, which was especially developed for Collision Activated Dissociation Mass Spectrometry, is given. In this instrument a high mass resolution and a very high sensitivity are obtained by application of special techniques like post-acceleration of fragment ions, quadrupole lenses, and an electro-optical, simultaneous ion detection system. For individual titles, see N82-22023 through N82-22027.

N82-22023# Technische Hogeschool, Delft (Netherlands).
A TANDEM MASS SPECTROMETER FOR COLLISION-INDUCED DISSOCIATION
In its An Ultra-Sensitive Instr. for Collision Activated Dissociation Mass Spectrometry With High Mass Resolution 23 Feb. 1982 p 9-26 refs (For primary document see N82-22022 12-74)
Avail: NTIS HC A06/MF A01

A tandem mass spectrometer is described for studies of collision-induced dissociation. This instrument is especially suited for investigations on organic molecules, e.g., biochemical

substances, for m/z values up to 1000. The first stage is formed by a conventional EI source and a sector magnet, and has a mass resolution of about 600. The first stage is provided with a collision gas cell at the site of the detector slit. In the second stage the fragment ions are post-accelerated in order to reduce the relative energy-spread and to increase the resolution and transmission. The fragment spectrum is analyzed by a second magnet (R = 750 mm, deflection angle = 15 deg) and simultaneously recorded. Quadrupoles are added in order to vary the dispersion and to aid focussing. The ratio between the highest and lowest masses in a simultaneously detected spectrum may vary from 4 : 1 to 1.06 : 1. The resolution can be as high as 600, and the transmission from the collision cell to the CEMA ranges from 60 to 100%; the detection sensitivity can be as high as 1 ion per 10 s. Author

N82-22024# Technische Hogeschool, Delft (Netherlands).
APPLICATION OF MATRIX CALCULATION 1: DESIGN AND ADJUSTMENT OF A TANDEM MASS SPECTROMETER FOR COLLISION-ACTIVATED DISSOCIATION (CAD)
In its An Ultra-Sensitive Instr. for Collision Activated Dissociation Mass Spectrometry With High Mass Resolution 23 Feb. 1982 p 29-58 refs (For primary document see N82-22022 12-74)
Avail: NTIS HC A06/MF A01

A matrix representation of the ion optics of the analyzing stage has been used in a computer model of a tandem mass spectrometer with simultaneous detection for CAD. The matrix algorithm of this model is discussed here as an elegant way of describing the ion optics in a first-order approximation. The accuracy of the calculations is illustrated by comparing calculated and measured adjustments of the instrument under normal experiment conditions. The ion-optical possibilities with respect to transmission, mass resolution influence of several ion optical parameters on the shape and position of the mass focal plane is discussed. The experimental values of mass range, mass resolution and ion transmission agree very well with the calculations. Moreover, the computer model appears to be a useful tool for giving clear insight into the operation of the rather complex ion optics of the instrument. The calculations have been further developed towards higher accuracy, making possible automatic focusing of the mass focal plane onto the detector. Author

N82-22025# Technische Hogeschool, Delft (Netherlands).
APPLICATION OF MATRIX CALCULATION 2: MASS SCALING OF CAD-FRAGMENT SPECTRA
In its An Ultra-Sensitive Instr. for Collision Activated Dissociation Mass Spectrometry With High Mass Resolution 23 Feb. 1982 p 59-71 refs (For primary document see N82-22022 12-74)
Avail: NTIS HC A06/MF A01

Two calibration methods of fragment mass spectra derived with CAD in a tandem MS are discussed. The instrument has a variable dispersion and is equipped with an electro-optical, simultaneous detection system. Without dispersion variation the masses of the fragment ions can be calculated by applying merely one calibration function. This function relates, at any value of the magnet field of the mass analyzer, the momentum of a fragment to its position on the detector. The dispersion can be changed by means of an electrostatic quadrupole lens, behind the sector magnet, which acts upon the energy of the fragment ions. A calculation method is introduced here, which opens the possibility of nominal mass scaling without needing a calibrant, even when the instrument is operated with varied dispersion. The method is based upon the representation of the ion-optical devices of the instrument by transfer matrices. Both mass scaling procedures discussed here can be used for nominal mass assignment up to about m/z 1000. Author

N82-22026# Technische Hogeschool, Delft (Netherlands).
A VERY SENSITIVE ELECTRO-OPTICAL SIMULTANEOUS ION DETECTION SYSTEM
In its An Ultra-Sensitive Instr. for Collision Activated Dissociation Mass Spectrometry With Mass Resolution 23 Feb. 1982 p 73-89 refs (For primary document see N82-22022 12-74)
Avail: NTIS HC A06/MF A01

A fully operational, electro-optical system for simultaneous detection is discussed. This system is applied for the simultaneous detection of fragment mass spectra, obtained by collision activated dissociation experiments. The detector itself consists of two chevron channelplates, phospher screen, fiber optics, camera objective and photodiode array. If forms part of an extensive information system, which controls the photodiode array and performs data processing as for example background subtraction and correction of the spectrum for spatial sensitivity variations of the detector. The detection system is characterized by a very low noise rate with an average value of about one dark ion per 250 s for each mass peak in the spectrum. The dynamic range of peak heights in a simultaneously detected spectrum can be up to 2.3 x 10 to the 4th power at a signal to noise ratio of 1. The reproducibility of peak area measurements is better than 20% over the entire length of the detector. Author

N82-22027# Technische Hogeschool, Delft (Netherlands).
STRUCTURE ANALYSIS OF PYROLYSIS FRAGMENTS BY COLLISION ACTIVATED DISSOCIATION MASS SPECTROMETRY
In its An Ultra-Sensitive Instr. for Collision Activated Dissociation Mass Spectrometry With High Mass Resolution 23 Feb. 1982 p 91-100 refs (For primary document see N82-22022 12-74)
Avail: NTIS HC A06/MF A01

Collision Activated Dissociation Mass Spectrometry (CAD-MS) is a rapidly developing technique for structure identification of unknown ions. It is based on the fact that the fragmentation pattern of ions is generally very characteristics for their composition and structure [1]. With this technique it is even possible to identify isomeric ions, which is generally not possible in conventional MS. L.F.M.

N82-22028# Materials Research Labs., Melbourne (Australia).
A MEANS OF SPECIFYING INFRARED PROPERTIES OF CAMOUFLAGE MATERIAL TO DEFEAT FALSE-COLOUR SURVEILLANCE
David R. Skinner 1980 18 p refs
(MRL-R-767) Avail: NTIS HC A02/MF A01

It is shown theoretically that when two objects are matched for visual color, the degree of match in false-color imagery is determined uniquely by the ratio of two spectrally weighted reflectances. A suitable set of weighting functions is derived, and ratios computed from this are shown experimentally to be strongly correlated with color differences in false-color photography of eycalyptus forest and plastics materials. Author

N82-22029# Aeronautical Research Labs., Melbourne (Australia).
A DIRECTIONAL SPOTLIGHT BAFFLE FOR CONTROL CABINS
K. W. Anderson and B. A. J. Clark Oct. 1980 38 p refs
(ARL/Sys-Rept-22; AR-002-240) Avail: NTIS HC A03/MF A01

Direct overhead lighting in control cabins frequently gives rise to unwanted bright images of the luminaries in the windows and these images may degrade the cabin operator's view of the external world. A directional baffle incorporating light traps which allow a high ratio of wanted to unwanted illumination from a specific conventional spotlamp is described. In practical tests, images from the spotlamp baffle combination were practically inconspicuous both in day and night conditions. A general method of design is described for extension of the principle to other types of spotlamps. S.L.

N82-22030*# Perkin-Elmer Corp., South Pasadena, Calif.
ACCEPTANCE TEST PROCEDURE OPTICAL TEST BENCH AND ALIGNMENT SYSTEM. X-RAY TEST FACILITY Final Report
D. S. Winans 15 Dec. 1975 74 p
(Contract NAS8-31297)
(NASA-CR-161982; NAS 1.26:161982) Avail: NTIS HC A04/MF A01 CSCL 20F

All requirements necessary to demonstrate the acceptability of the total system of the optical test bench for the X-ray telescope test facility are listed including its motor drives, its electrical control system and the optical alignment system. The procedures cover all modes of operations during checkout of the system at the initial trial assembly of all components at the manufacturer's facilities as well as after the final installation of the system at Marshall Space Flight Center. A.R.H.

N82-22031# Hawaii Univ., Honolulu.
LONG BASELINE MEASUREMENTS OF LIGHT TRANSMISSION Final Technical Report
Hugh Bradner (California Univ., San Diego) and Grant Blackinton Dec. 1981 13 p Sponsored in part by Hawaii Inst. of Geophysics.
(Contract N00014-79-C-0818)
(AD-A110180) Avail: NTIS HC A02/MF A01 CSCL 20/6

Measurements have been made of the uncollimated (poor geometry) 1/e transmission distance of light in seawater, at approximately 1 km and 1.5 km depths, 27 km east of the center of the proposed DUMAND site off Keahole Point, Hawaii. The measurements were made with 480 nanometer blue-green light, through path lengths of 84.0 meters and 7.86 meters. Author (GRA)

N82-22032# Indiana Univ. at Bloomington. Dept. of Physics.
OPTICAL PUMPING STUDIES OF COLLISIONAL INTERACTIONS Final Report
F. A. Franz 23 Nov. 1981 27 p refs
(Grant AF-AFOSR-0897-81)
(AD-A110309; AFOSR-81-0897TR) Avail: NTIS HC A03/MF A01 CSCL 20/6

A final scientific report is given on a project involving application of optical pumping techniques to studies of atomic collisions. Magnetic depolarization, nuclear spin efforts, collisional selection rules, surface interactions, and studies of sudden and quasi molecular collisions between alkali atoms and noble gas atoms are particularly emphasized. Author (GRA)

N82-22033# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
A LIGHTNESS SCALE FROM IMAGE INTENSITY DISTRIBUTIONS
W. A. Richards 19 Aug. 1981 37 p refs
(Contract N00014-80-C-0505)
(AD-A109917; AI-M-648) Avail: NTIS HC A03/MF A01 CSCL 20/6

A lightness scale is derived from a theoretical estimate of the probability distribution of image intensities for natural scenes. The derived image intensity distribution considers three factors: reflectance, surface orientation and illumination, and surface texture (or roughness). The convolution of the effects of these three factors yields the theoretical probability distribution of image intensities. A useful lightness scale should be the integral of this probability density function, for then equal intervals along the scale are equally probable and carry equal information. The result is a scale similar to that used in photography, or by the nervous system as its transfer function. Author (GRA)

N82-22034# National Physical Lab., Teddington (England). Div. of Mechanical and Optical Metrology.
THE CLEANING OF OPTICAL SURFACES
S. P. Talim Aug. 1980 16 p refs
(NPL-MOM-46; ISSN-0309-3069) Avail: NTIS HC A02/MF A01

Different cleaning procedures are reviewed. Surface cleaning is characterized for three processes: (1) the removal of particulate and/or film contamination; (2) washing to remove any residual material without recontamination of the surface; and (3) drying. Next, glow discharge cleaning as used in the preparation of surfaces prior to thin film deposition is commented on. In due consideration of the methods reviewed, a procedure for cleaning substrates is proposed. The assessment of cleanliness is outlined. The cleaning obtained compares favorably with the results achieved by more complex methods. Author (ESA)

N82-22035# National Physical Lab., Teddington (England). Div. of Quantum Metrology.
TUNGSTEN RIBBON LAMPS FOR THE CALIBRATION OF DISAPPEARING FILAMENT PYROMETERS
P. B. Coates Mar. 1981 16 p
(NPL-QU-62; ISSN-0309-3050) Avail: NTIS HC A02/MF A01

The technical and metrological characteristics of the different types of tungsten ribbon lamps, the construction requirements to be met by the manufacturer of the lamps and the verification procedures to be followed by the calibrating laboratories to ensure uniformity are given. Recommended performance limits for vacuum and gas filled lamps, calibration uncertainties in deg C for laboratory standards and maximum permissible calibration uncertainties are listed. Author (ESA)

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N82-22036 Los Alamos Scientific Lab., N. Mex.
RAVEN PHYSICS MANUAL
Thomas A. Oliphant Jun. 1981 26 p refs
(Contract W-7405-eng-36)
(LA-8802-M) Avail: NTIS HC A03/MF A01

The physics in the RAVEN code and the numerical methods used in implementing the physics are documented. The development of the one-dimensional magnetohydrodynamics code RAVEN is part of a broadly based and highly flexible program for the study of many experimental situations. The developmental philosophy of the RAVEN code is to broaden the structure gradually to apply to more and more general situations while keeping previous simple calculations as default options. R.J.F.

N82-22037# Association Euratom-CEA, Grenoble (France). Dept. de Recherche sur la Fusion Controlee.
THE FEASIBILITY OF IGNITING A THERMONUCLEAR PLASMA WITH LOWER HYBRID HEATING
M. Brambilla Sep. 1980 18 p refs
(CEA-CONF-5441) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Library

The present theoretical understanding of coupling, propagation and adsorption of lower hybrid waves in large plasmas is briefly reviewed. Linear theory of coupling and propagation, stochastic ion heating in the vicinity of the Linear Turning point, and quasilinear electron Landau damping provide a plausible physical model to evaluate the feasibility of reaching ignition with L.H. heating. This auxiliary heating method, which is very attractive from the engineering point of view, demands a careful choice of the working parameters (frequency, antenna periodicity, etc ...) to cover the large temperature excursion from an ohmically heated steady state to ignition. The domains in which in our opinion further theoretical work is particularly needed, or comparison with experiments unsatisfactory, are also identified. L.F.M.

N82-22038*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TEMPERATURE GRADIENT AND ELECTRIC FIELD DRIVEN ELECTROSTATIC INSTABILITIES
Philip J. Morrison and James A. Ionson Feb. 1982 14 p refs
(NASA-TM-83893; NAS 1.15:83893) Avail: NTIS HC A02/MF A01 CSCL 20I

The stability of electrostatic waves to thermodynamic and electric potential gradients was investigated. It is shown that thermodynamic gradients drive instabilities even when the internal electric field vanishes. Skewing of the distribution function is not included in the dielectric. E.A.K.

N82-22039# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ELECTRON CAPTURE AND LOSS CROSS SECTIONS FOR COLLISIONS BETWEEN HEAVY IONS AND HYDROGEN MOLECULES
Y. Kaneko (Tokyo Metropolitan Univ.), Y. Itikawa, T. Iwai (Kansai Medical Univ.), T. Kato, Y. Nakai (Japan Atomic Energy Research Inst.), K. Okuno (Tokyo Metropolitan Univ.), and H. Tawara (Kyushu Univ.) Dec. 1981 152 p refs
(IPPJ-AM-20) Avail: NTIS HC A08/MF A01

Compiled are experimental data on the cross sections for electron-capture and -loss collisions between heavy ions (Z > Li) and hydrogen molecules. The result is shown in graphs as a function of the incident energy of the ions. R.J.F.

N82-22040# Nagoya Univ. (Japan). Inst. of Plasma Physics.
OBSERVATION OF SPATIAL ALFVEN RESONANCE
A. Tsushima (Shizuoka Univ.), Y. Amagishi, and M. Inutake

(Tsukuba Univ.) Nov. 1981 13 p refs
(IPPJ-550) Avail: NTIS HC A02/MF A01

Axisymmetric Alfven waves are excited by Stix coils to investigate the spatial properties of shear Alfven resonance. The maximum aximuthal magnetic field of excited waves is located at Alfven resonance layer, which is a function of both frequency and wavelength. The polarization also changes continuously from right hand to left hand rotation through the resonance layer. S.L.

N82-22041# Nagoya Univ. (Japan). Dept. of Crystalline Materials Science.
SURFACE DATA FOR FUSION DEVICES
Noriaki Itoh, ed. and Edward W. Thomas, ed. (Georgia Inst. of Technology) 1981 103 p refs Proc. of the U.S.-Japan Workshop on Surface Data Rev., Nagoya, Japan, 14-18 Dec. 1981
(IPPJ-AM-21) Avail: NTIS HC A06/MF A01

The status of knowledge of the mechanisms relevant to the plasma-wall interactions in fusion devices is surveyed. For individual titles, see N82-22042 through N82-22048.

N82-22042# Nagoya Univ. (Japan). Inst. of Plasma Physics.
DATA NEEDS FOR EDGE MODELING OF TOKAMAK PLASMAS
Tsuneo Amano *In its* Surface Data for Fusion Devices 1981 p 1-8 refs (For primary document see N82-22041 12-75)
Avail: NTIS HC A06/MF A01

It is recognized that in order to evaluate the role of plasma wall interaction on large Tokamaks, an accurate modeling of the edge plasma in the scrape-off region which directly interacts with the limiter (or divertor) is needed. A self-consistent modeling of the edge plasma by solving the plasma transport and impurity rate and diffusion equations was attempted. The plasma flow loss to the limiter and the resulting sputtering of the limiter are calculated. Sputtering of the wall by charge exchange fast neutrals is also considered. Sputtered impurity atoms are partly shielded by the plasma in the scrape-off region and partly enter into the main plasma region. The cooling of the plasma in the scrape-off region due to impurity radiations is included to obtain the edge electron temperature which governs the sputtering. The data requirements for the model are summarized. M.G.

N82-22043# Nagoya Univ. (Japan). Dept. of Crystalline Materials Science.
PLASMA-WALL INTERACTION
Noriaki Itoh *In its* Surface Data for Fusion Devices 1981 p 9-19 refs (For primary document see N82-22041 12-75)
Avail: NTIS HC A06/MF A01

The status of knowledge on plasma-wall interactions is briefly surveyed. The basic processes are identified including reflection, accommodation and desorption, trapping and detrapping, and sputtering. In addition the collision, solid state, and radiation phenomena related to each of these processes is listed. M.G.

N82-22044# Osaka Univ. (Japan). Dept. of Applied Physics.
SPUTTERING-MATERIAL REMOVAL RATE
Ryuichi Shimizu *In* Nagoya Univ. Surface Data for Fusion Devices 1981 p 20-24 (For primary document see N82-22041 12-75)
Avail: NTIS HC A06/MF A01

The basic processes of sputtering are described. When an incident projectile impinges on a target, a certain amount of kinetic energy is transfered to target atoms though elastic scattering between the incident and target atoms. If this energy transfered to the target atom exceed displacement energy, the target atom moves out from the original site undergoing similar scattering processes as does the incident projectile. This results in so-called collision cascade. Some of recoiled atoms generated in the collision cascade reach the surface to escape from the surface as sputtered atoms if their kinetic energies are large enough to overcome the surface barrier. This sputtering is measured by the sputtering yield as the mean number of atoms removed from a bombarded surface per incident particle. Models are presented for determining sputtering yields for the linear and nonlinear cascade regimes and for the case of compounds and alloys. M.G.

N82-22045# Argonne National Lab., Ill. Chemistry Div.
CHARGE, QUANTUM STATE AND ENERGY DISTRIBUTIONS OF IMPURITIES RELEASED IN PLASMA-WALL INTERACTION PROCESSES
Dieter M. Gruen *In* Nagoya Univ. Surface Data for Fusion Devices 1981 p 25-30 Sponsored by DOE (For primary document see N82-22041 12-75)
Avail: NTIS HC A06/MF A01

It is noted that certain generic characteristics such as the charges, quantum states and energy distributions of impurities are common to all impurity release mechanisms and play important roles in determining the fractions of the erosion products which, by making their way into the plasma, cause serious plasma energy losses through radiative processes. The conditions leading to charged or excited state atom emission and the energy distributions of such species are reviewed. Techniques for measuring these quantities are discussed and the need for a wider data base in this field is pointed out. M.G.

N82-22046# Japan Atomic Energy Research Inst., Ibaraki.
CHEMICAL REACTION AND CHEMICAL SPUTTERING
R. Yamada *In* Nagoya Univ. Surface Data for Fusion Devices 1981 p 31-36 refs (For primary document see N82-22041 12-75)
Avail: NTIS HC A06/MF A01

Low-Z materials for plasma confinement devices that contain carbon, oxygen, boron and silicon atoms are known to form gaseous molecules, which have lower binding energies than the original surface atoms, by chemical reactions between incident hydrogen atoms or ions and surface atoms. It is essential that such chemical reactions are included into the evaluation of the wall erosion in addition to physical sputtering. Available data of chemical reaction and chemical sputtering of carbon and carbide as a function of target temperature, ion energy, ion dose and dose rate are compiled. M.G.

N82-22047# Sandia Labs., Albuquerque, N. Mex.
HYDROGEN TRAPPING, DETRAPPING AND RE-EMISSION FROM FUSION FIRST WALLS
B. L. Doyle *In* Nagoya Univ. Surface Data for Fusion Devices 1981 p 37-72 refs (For primary document see N82-22041 12-75)
(Contract DE-AC04-76DP-00789)
Avail: NTIS HC A06/MF A01

A review is made of the current status of both the data base and understanding of processes which occur when hydrogen is injected into materials. Equations pertinent to these processes are derived in order to facilitate the assessment of the importance of the various plasma and material parameters which come into play. The response of H injected energetically into materials falls into four categories which depend upon (1) a simple analytic transport parameter W which characterizes either diffusion limited ($W > 1$) or recombination limited ($W < 1$) transport in the material and (2) the temperature, T, which determines the importance of damage trapping. M.G.

N82-22048# Tsukuba Univ. (Japan). Inst. of Materials Science.
DESORPTION AND ADSORPTION
Atsushi Koma *In* Nagoya Univ. Surface Data for Fusion Devices 1981 p 73-76 refs (For primary document see N82-22041 12-75)
Avail: NTIS HC A06/MF A01

The characteristic features of various desorption processes are examined. Desorption plays significant roles in the plasma-wall interactions in two ways, which occur at the surface of the nuclear fusion devices. One is the impurity introduction process. Such impurity atoms as C an O on the first wall go into the plasma due to the desorption and cause the serious radiation loss. The other is the fuel gas recycling process. The hydrogen isotopes are adsorbed on the surface of the first wall and go back to the plasma due to the desorption. This process makes important contributions to the energy and particle balances of the plasma. M.G.

N82-22049# California Univ., Los Angeles. Center for Plasma Physics and Fusion Engineering.
PONDEROMOTIVE POTENTIAL NEAR GYRORESONANCE
Guy Dimonte, B. M. Lamb, and G. J. Morales Nov. 1981 16 p refs

(Contract N00014-75-C-0476)
(AD-A109934; PPG-594) Avail: NTIS HC A02/MF A01 CSCL 20/9

In summary, a second order perturbation calculation illustrates the finite nature of the ponderomotive effect near the gyroresonance and is in excellent agreement with detailed experimental observations with test ions. Near the gyrofrequency the ponderomotive potential is a function not only of position but also depends on the velocity of the particles. GRA

N82-22050# Association Euratom-CEA, Fontenay-aux-Roses (France).
ALL METAL ARRAY OF ANTENNAE FOR RF HEATING OF TOKAMAKS IN THE ION CYCLOTRON RANGE OF FREQUENCY
J. Jacquinot, H. Lebot, J. Adams, and H. Kuus Sep. 1980 6 p refs Presented at the Symp. on Fusion Technol. (SOFT), Oxford, 15-19 Sep. 1980
(CEA-CONF-5472; CONF-800950-28) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The maximum available RF power, 500 kW, at a frequency of 60 MHz and in 50 to 100 ms pulses, was launched in TFR plasmas using an array of 4 half turn antennae. The array described has a potential power capability of 1 MW through a single port. The electrical coupling efficiency is about 90 percent. DOE

N82-22051# Illinois Univ., Urbana. Nuclear Engineering Program.
EFFECT OF LOSS-CONE-LIKE SCATTERING TRANSPORT ON PARTICLE CONFINEMENT AND ROTATION IN THE FIELD-REVERSED THETA PINCH Ph.D. Thesis
Que Tsang Fang 1981 214 p refs
(Contracts DE-AS02-76ET-52040; DE-AC02-76ET-52040)
(DE82-002711; DOE/ET-52040/T5; COO-2218-229) Avail: NTIS HC A10/MF A01

The Field-Reversed Theta Pinch (FRTP) represents a promising confinement approach to fusion power. However some experiments encountered rapid particle losses and plasma disruption after a period of increasing rotation frequency. The present research developed theoretical models to explain the phenomena and simultaneously explore ways to reduce losses and spin-up. To account for the rapid particle losses, an ion transport theory was proposed based on the existence of a loss-cone-like region in H-P/sub phi/space (or a corresponding one in velocity space) for the FRTP. This loss region was observed to have an effect on particle losses analogous to that of the conventional mirror loss cone, although now the loss region varies with radial position. DOE

N82-22052# Illinois Univ., Urbana. Dept. of Physics.
RADIAL ELECTRIC FIELDS FOR IMPROVED TOKAMAK PERFORMANCE Ph.D. Thesis
Wesley Berry Downum 1981 143 p refs
(DE82-002714; DOE/ET-52040/T4; COO-2218-228) Avail: NTIS HC A07/MF A01

The influene of externally imposed radial electric fields on the fusion energy output, energy multiplication, and alpha particle ash build up in a TFTR sized, fusing Tokamak plasma was explored. In an idealized Tokamak plasma, and externally imposed radial electric field leads to plasma rotation, but no charge current flows across the magnetic fields. A realistically low neutral density profile generates a nonzero cross field conductivity and the species dependence of this conductivity allows the electric field to selectively alter radial particle transport. DOE

N82-22053# Fom-Instituut voor Plasmafysica, Jutphaas (Netherlands).
EXPERIMENTAL AND THEORETICAL ACTIVITIES IN PLASMA PHYSICS Annual Status Report, 1980
Mar. 1981 68 p refs Sponsored by Euratom and Nederlandse Organisatie voor Zuiver-Wetenschappelijk Onderzoek (ZWO)
Avail: NTIS HC A04/MF A01

Work carried out on pinches, turbulent heating in TORTUR, gas-blanket research, and diagnostics is reported. Reports on magnetohydrodynamics, wave dynamics, transport problems, and generalized functions are given. Design studies for SPICA II, and both hardware and software developments of the central computer facilities are reported. The SPICA system is shown to have only a small parameter space with grossly stable high-beta plasmas of high temperature; initial discharge conditions cannot be improved. Introduction of oxygen contamination in the numerical model for RINGBOOM II plasmas, which cover the parameter space between low-density Tokamak plasma and high-density radiation-cooled arc, gives improved agreement with experimental results. Improved discharge parameters were achieved with TORTUR II, giving a small Tokamak suitable for the planned application of turbulent heating pulses.Author (ESA)

N82-22054# Physical Research Lab., Ahmedabad (India).
SYSTEM OPERATION FOR PLASMA-NEUTRAL GAS INTERACTION EXPERIMENT
H. D. Pujara, K. S. Lali, S. K. Mattoo, Y. C. Saxena, and N. Venkataramani Apr. 1981 22 p refs
(PB82-121609; PRL/TN-81-04) Avail: NTIS HC A02/MF A01 CSCL 20I

A system to discharge sequentially four stored condenser banks is described. These banks are used for producing a pulsed magnetic field, for opening two electromagnetic gas valves and producing a plasma discharge in the coaxial plasma gun deployed in experimental system to study the interation between a magnetized plasma and a neutral gas. The discharges are initiated by firing spark gaps through thyratron switches which, in turn, are operated by trigger signals. The condenser banks are discharged in a sequence predetermined by the experimental requirements. GRA

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

N82-22055# Texas Univ. at Arlington. Dept. of Chemistry.
FERMI LEVEL PINNING AT SEMICONDUCTOR ELECTRODES Progess Report, 1 Sep. 1981 - 31 Aug. 1982
G. Nagasubramanian, Bob Lee Wheeler, Fu-Ren F. Fan, and A. J. Bard 21 Dec. 1981 23 p refs Proc. of the 160th Meeting of the Electrochem. Soc. Submitted for publication Sponsored in part by NSF and Midwest Research Inst.
(Contract N00014-78-C-0592)
(AD-A109478; TR-21) Avail: NTIS HC A02/MF A01 CSCL 20/12

The shift in V(fb) of several single crystal semiconductors (p-Si, p-GaAs, n-TiO2, n-Cds, n-MoSe2, n- and p-WSe2) was investigated in MeCN containing a number of redox couples. While V(fb) shifts with V(redox) for p-Si, p-GaAs, n-TiO2 and n-Cds for the layered compounds (n-MoSe2, n- and p-WSe2) was essentially independent of V(redox). Author (GRA)

N82-22056# Chicago Univ., Ill. James Frank Inst.
NUCLEAR TRANSMUTATION DOPING OF GaAs Final Report, 1 Jun. 1980 - 30 Jun. 1981
Hans Fritzsche Sep. 1981 50 p refs
(Grant AF-AFOSR-0231-80)
(AD-A110433; AFOSR-82-0024TR) Avail: NTIS HC A03/MF A01 CSCL 20/2

Shallow donors have been introduced into GaAs crystals by irradiation with thermal neutrons and subsequent nuclear transmutation. Good agreement was found between the measured concentrations of added donors and the values expected from the neutron capture cross sections and the neutron fluences used. This doping method is approximately 1000 times more efficient in GaAs than in Si because of the higher abundances and neutron capture cross sections of the transmutable isotopes in GaAs. In epitaxially grown GaAs of high purity, the recoil and radiation damage associated with transmutation doping can be removed by annealing at about 600 C which is below the critical temperature for As effusion. The electronic transport properties of transmutation doped GaAs samples were studied between 1.4 and 450 K of concentrations both above and below the metal-nonmetal transition. We found that transmutation doping is a convenient method for introducing a desired concentration of shallow donors into GaAs crystals for modifying their electronic properties. GRA

N82-22057# Edinburgh Univ. (Scotland).
A STUDY OF STRUCTURAL PHASE TRANSITIONS USING LIGHT SCATTERING TECHNIQUES Final Technical Report
W. Taylor Dec. 1981 12 p refs
(Contract DAJ37-80-C-0045; DA Proj. 1T1-61102-BH-57)
(AD-A110195) Avail: NTIS HC A02/MF A01 CSCL 20/2

This report describes light scattering measurements from a variety of materials which undergo structural phase transitions. The materials studied include Pb5Ge3O11, SrTiO3, BaTiO3, RbCaF3, KMnF3, KH2PO4, KD2PO4, K2SeO4, BaMnF4, Ag3AsS3, AgI and Li2B4O7. Effects studied include: the influence of defects; the spectral response of 'soft modes'; the existence of dynamic precursor clusters; central peaks; incommensurate excitations; disorder effects in superionic and other crystals.
Author (GRA)

N82-22058# State Univ. of New York at Albany. Dept. of Physics.
SUPERCONDUCTIVITY IN HYDROGEN-CHARGED COPPER-IMPLANTED PALLADIUM Final Report
A. Leiberich, W. Scholz, W. J. Standish, and C. G. Homan (Army Armament Research and Development Command, Watervliet, N.Y.) Watervliet, N.Y. Army Armament Research and Development Command Dec. 1981 18 p refs Presented at the 3rd Ion Beam Intern. Meeting, Grenoble, France, Sep. 1981 Submitted for publication
(DA Proj. 1A1-283121-A-1-A)
(AD-A110133; ARLCB-TR-81045) Avail: NTIS HC A02/MF A01 CSCL 20/3

A superconducting transition temperature, T sub c of 124 K was observed in palladium implanted with copper ions and electrolytically charged with hydrogen at dry ice temperature. A step wise warmup procedure between 77 K and 273 K produces considerable variations in T sub c. Annealing the copper implanted palladium before electrolysis does not change T sub c to a substantial degree.
Author (GRA)

N82-22059# Army Electronics Research and Development Command, Fort Monmouth, N. J. Electronics Technology/Devices Lab.
MAGNETOCRYSTALLINE ANISOTROPY IN THE SYSTEMS SAMARIUM-COBALT-IRON AND SAMARIUM-MANGANESE-COBALT-IRON
F. Rothwarf, H. A. Leupold, and A. Tauber Sep. 1981 26 p refs
(DA Proj. 1L1-61102-AH-47)
(AD-A109952; DELET-TR-81-18) Avail: NTIS HC A03/MF A01 CSCL 20/2

The anisotropy fields (HA) and saturation magnetizations (4 pi Ms) of the systems Sm2(Co1-xFex)17 and Sm2Mn(Co1-xFex)16 were measured at 4.2 K and 300 K in applied fields up to 100 kOe. The presence of the Mn in the latter system raised the anisotropy fields by as much as 55% over those measured for the corresponding compounds in the ternary system. The augmentation of anisotropy was accompanied by a slight decline in 4 pi Ms of approximately 5% for the materials of highest HA. The values of 4 pi Ms for the quaternary compounds showed much less temperature dependence, increasing by about 5% in going from 300 K to 4.2 K as compared to 15% for the ternary system. A comparison of the present HA results with previous anisotropy measurements of Perkins and Straessler, obtained by extrapolation from applied fields up to 20 kOe showed the latter to be too low by as much as 50%. The effect of the higher HA values on the anisotropy constant KI and the crystal field parameter <r> ang 2 will be presented and the consequences discussed.
Author (GRA)

N82-22060# Oxford Univ. (England). Chemical Crystallography Lab.
MAGNETIC ORDERING IN OXIDE SOLID SOLUTIONS Final Scientific Report, 1 Sep. 1979 - 31 Aug. 1981
A. K. Cheetham 6 Jan. 1982 9 p refs
(Grant AF-AFOSR-0120-79; AF Proj. 2301)
(AD-A110138; EOARD-TR-82-3) Avail: NTIS HC A02/MF A01 CSCL 20/3

Powder neutron diffraction, magnetic susceptibility and Mossbauer spectroscopy were used to investigate solid solutions based upon MnO, FeO, CoO and NiO, and we have completed measurements on NiO-CoO, MnO-CoO, NiO-MnO, FeO-MnO and FeO-CoO. In each system we have examined the changes of spin direction and crystal symmetry as a function of temperature and composition in the antiferromagnetic phases. The results show that the strength of the magnetic anisotropy associated with the metal ions falls in the sequence Co2+ > Mn2+ > > Fe2+ - Ni2+ -. This order is different from that found in mixed fluorides of the type K2MF4(Co2+ > Fe2+ > Ni2+), and we have considered, in some detail, the unexpected weakness shown by Fe2+ in our materials.
GRA

N82-22061# Texas Univ. at Arlington. Dept. of Chemistry.
SEMICONDUCTOR ELECTRODES. 43: THE EFFECT OF LIGHT INTENSITY AND IODINE DOPING ON THE STABILIZATION OF N-SILICON BY PHTHALOCYANINE FILMS Technical Report, 1 Sep. 1981 - 31 Aug. 1982
Patrick Leempoel, Mauricio Castro-Acuna, Fu-Ren F. Fan, and Allen J. Bard 21 Dec. 1981 30 p refs Submitted for publication
(Contract N00014-78-C-0592; NR Proj. 051-693)
(AD-A110006; TR-19) Avail: NTIS HC A03/MF A01 CSCL 20/12

The stability of n-Si vacuum coated with metal free phthalocyanine (H2Pc) and copper phthalocyanine (CuPc) was studied as a function of the light intensity and redox couple in aqueous solutions. Although the photocurrent at an n-Si coated with H2Pc or CuPc decayed slowly at low light intensities (1 mW/sq cm), photopassivation was rapid at higher light intensities (100 mW/sq cm). The magnitude of photocurrent and the inhibition of photocorrosion depended upon the solution conditions. Addition of iodine, which is a dopant for the Pc layer, led to larger photoeffects and a lower rate of photopassivation, although the electrode was still unstable after longer irradiation times. Further improvement in stability was observed in the presence of the highly concentrated electrolyte, 11 M LiCl.
M.G.

N82-22062# Texas Univ. at Arlington. Dept. of Chemistry.
PHOTOELECTROSYNTHESIS AND PHOTOCATALYSIS AT SEMICONDUCTOR ELECTRODES Technical Report, 1 Sep. - 31 Aug. 1981
Allen J. Bard 1 Aug. 1981 37 p refs Submitted for publication
(Contract N00014-78-G-0592; Grant NSF CHE-80-00682; NR Proj. 051-693)
(AD-A110136; TR-18) Avail: NTIS HC A03/MF A01 CSCL 20/12

The principles and applications of semiconductor electrodes in photoelectrochemical (PEC) cells for carrying out useful chemical reactions are described. The factors in the design of efficient and stable systems and semiconductor particulate systems constructed on the basis of PEC cell principles are discussed.
Author (GRA)

N82-22063# Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Research and Development Center.
TEMPERATURE COMPENSATED PIEZOELECTRIC MATERIALS Semiannual Technical Report, 15 May - 30 Nov. 1980
R. R. Neurgaonkar Jan. 1981 54 p refs
(Contract F49620-78-C-0098; AF Proj. 3570)
(AD-A110197; ERC41007.14SDA; AFOSR-81-0896TR; SATR-3) Avail: NTIS HC A04/MF A01 CSCL 20/3

From the electrostriction measurements on SBN crystals, it was found that the fourth order electrostrictive coupling terms are not adequate to fully describe the paraelectric phase above Curie temperature, and hence six rank coupling terms are needed; the electrostrictive coupling terms do not change markedly with cation substitution. Several flux systems have successfully been developed for the liquid phase epitaxy work of SBN compositions. The work is successful, and it is possible to develop epilayers of SBN compositions.
Author (GRA)

N82-22064# Sperry Research Center, Sudbury, Mass.
NIOBIUM NITRIDE JOSEPHSON DEVICES WITH SEMICONDUCTOR BARRIERS Final Report, 27 May 1980 - 25 Sep. 1981
H. Kroger, D. W. Jillie, and L. N. Smith Sep. 1981 49 p refs

(Contract N00173-80-C-0159)
(AD-A110128; SRC-CR-81-65) Avail: NTIS HC A03/MF A01 CSCL 20/12

Semiconductor barriers are investigated as a means of producing NbN-barrier-NbN and NbN-barrier-Nb Josephson devices. Chemical vapor deposition of silicon and germanium polycrystalline barriers onto NbN substrates and sputter deposition of amorphous silicon onto NbN substrates were used to produce the barrier layers. NbN-aSi-Nb tunnel junctions which had a Vm (product of critical current and subgap resistance) as high as 15 mV were fabricated. Phosphorus doped Ge barriers about 60 A thick produced tunnel junctions with Vm = 2-3 mV. Super Schottky diodes were produced with boron doped germanium barriers about 130 A thick. Boron doped germanium barriers about 60-70 A thick were observed to have Josephson coupling with good uniformity as judged by ideal threshold curves, but had non-ideal tunneling characteristics. Nbn-Ge-NbN devices were produced by first depositing the trilayer structure over the entire wafer and then isolating the desired junctions by thermally oxidizing the upper NbN layer between devices, with the device area being protected from oxidization by a patterned SiO2 layer. Some correlation between good tunneling characteristics and the crystal structure and high optical reflectivity of the lower NbN electrode was observed. Author (GRA)

N82-22065# IBM Watson Research Center, Yorktown Heights, N.Y.
THE FORMATION OF THE SCHOTTKY BARRIER AT THE V/Si INTERFACE
J. G. Clabes, G. W. Rubloff, B. Reihl, R. J. Purtell, P. S. Ho, A. Zartner, F. J. Himpsel, and De. E. Eastman 1 Dec. 1981 19 p refs Submitted for publication
(Contract N00014-77-C-0366; NR Proj. 056-651)
(AD-A109912; TR-22) Avail: NTIS HC A02/MF A01 CSCL 20/12

Synchrontron radiation photoemission measurements have been used to study the behavior of the Schottky barrier height 00 bn and electronic structure of the V/Si interface for both cleaved Si (111)-(2x1) and sputter-cleaned Si(111)-(7x7) surfaces. Although the Schottky barrier height 0 bn of the clean surface is influenced by surface reconstruction, the barrier becomes pinned at a position essentially independent of the initial clean surface structure. GRA

N82-22066# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.
CHEMICALLY DERIVATIZED SEMICONDUCTOR PHOTOELECTRODES Interim Technical Report
Mark S. Wrighton 4 Jan. 1982 46 p refs Submitted for publication
(Contract N00014-75-C-0880; NR Proj. 051-579)
(AD-A110087; TR-32) Avail: NTIS HC A03/MF A01 CSCL 20/12

Highlights of research results from the chemical derivatization of n-type semiconductors with (l,l'-ferrocenediyl)dimethylsilane, (1) and its dichloro analogue, (2) and from the derivatization of p-type semiconductors with (N,N'-bis(3-trimethoxysilyl)propyl)-4, 4'-bipyridinium)dibromide, (3) are presented. Research Shows that molecular derivatization with (2) can be used to suppress photoanodic corrosion of n-type Si; derivatization of p-type Si with (3) can be used to improve photoreduction kinetics of horseheart ferricytochrome c; derivatization of p-type Si with (3) followed by incorporation of Pt(O) improves photoelectrochemical H2 production efficiency. Strongly interacting reagents can alter semiconductor/electrolyte interface energetics and surface state distributions as illustrated by n-type WS2/I(-) interactions and by differing etch procedures for n-type CdTe. Author (GRA)

N82-22067# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France).
STUDY OF CRYSTALLINE DEFECTS IN (-)-IRON Ph.D. Thesis - Paris VII Univ., 21 Mar. 1980
Annie Dunlop Jan. 1981 133 p refs In FRENCH; ENGLISH summary
(CEA-R-5053) Avail: NTIS (US Sales Only) HC A07/MF A01; DOE Depository Libraries

Configurations of the defects produced in ferromagnetic metals (Fe, Co, Ni) during low-temperature irradiations were studied. The anomalous shape of the damage production rate curves, resistivity increase; and irradiation influence of iron and nickel during neutron irradiations was found. The following interpretation was proposed: stability of the defect configurations created during low-temperature self-ion irradiations of these metals; instability of these defect configurations where there was was sufficient cascade overlap. Using the model, the iron results can be reproduced with the following parameters: characteristic volume for the recovery and division of the average resistivity of the defects when they agglomerate. The influence of irradiation defects on the longitudinal magnetoresistance of the samples was also studied. The increase in the number of scattering centers makes the resistivity anisotropy change gradually from a region in which the normal magnetoresistance was predominant to another in which the spontaneous anisotropy dominated. This last regime was studied with the two-current conduction model in ferromagnetics. M.D.K.

N82-22068# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France).
INTRINSIC THERMAL EXPANSION OF CRYSTAL DEFECTS Ph.D. Thesis - Paris VI, 23 Jun. 1980
Jean-Pierre Ganne Feb. 1981 131 p refs In FRENCH; ENGLISH summary
(CEA-R-5079) Avail: NTIS (US Sales Only) HC A07/MF A01; DOE Depository Libraries

The intrinsic thermal expansion coefficients (ITEC) (ALPHA) sub(d) of a point defect, derived from its formation volume v sub(d) was measured directly. A differential dilatometer by interferometry was constructed and is described. It allowed (ALPHA)sub(d) to be measured for several defects. Vacancies and small interstitial loops were produced in aluminum by low temperature (20 K) fast neutron irradiation followed by an anneal up to the beginning of stage III (160 K). The very high value of the measured ratio was comparable with a lattice statics calculated for a vacancy in sodium. (ALPHA)sub(d) was also measured for several alloying elements in copper: CuAl, where the thermal expansion could be related to another anharmonic property, the third order elastic constants; CuNi, Ga, Ge, where the impurity effect was proportional to its valence difference with the matrix, and CuAu. The relationship between two different theoretical approaches to the thermal expansion of defects, using a generalization of the quasi-harmonic model is discussed. M.D.K.

N82-22069# Northeastern Univ., Boston, Mass.
HIGH-PRESSURE STUDIES TO DETERMINE THE EFFECTS OF VOLUME AND TEMPERATURE ON THE LATTICE DYNAMICS OF MOLECULAR SOLIDS: N2, CO2, CH4 Final Report, 1 Jul. 1979 - 31 Aug. 1981
F. D. Medina Aug. 1981 42 p refs
(Contract DE-AC02-79ER-10443)
(DE82-000398; DOE/ER-10443/3) Avail: NTIS HC A03/MF A01

The main goal of the project was to carry out spectroscopic information on the intermolecular potentials of simple molecular solids were conducted. A new high pressure infrared was specifically designed for the project. IR studies in (-)-N2 resulted in positive anharmonic self-energy shifts and a Grueneisen parameter of 3. Preliminary analysis of similar studies of solid methane indicate little anharmonicity in phase III and a transition to a phase IV which might explain a previously observed dielectric anomaly. Raman studies in solid CH4 indicate an anisotropic intermolecular potential with a strong volume dependence, again little anharmonicity, and a III-IV phase transition which involves the reorientation of some molecules. In fluids, the density dependence on intramolecular frequencies had a striking resemblance to the intermolecular potential and molecular dynamics. Calculations of the effect are yet to be completed. DOE

N82-22070# Centre National de la Recherche Scientifique, Marseilles (France).
NON-LINEAR PARTIAL DIFFERENCE EQUATIONS FOR THE TWO-SPIN CORRELATION FUNCTION OF THE TWO-DIMENSIONAL ISING MODEL
Barry M. McCoy and Tai Tsun Wu Jul. 1980 50 p refs Submitted for publication
(Contract DE-AS02-76ER-03227; Grant NSF DMR-79-08556)
(CNRS-CPT-80-P-1225) Avail: NTIS (US Sales Only)

HC A03/MF A01; DOE Depository Libraries

The two point fucntion of the two dimensional Ising model is presented. The model is expressed in terms of the solution of a nonlinear partial difference equation on the lattice. From this difference equation, the known results for the two point function of the Ising field theory are regained by taking the scaling limit. DOE

N82-22071# Xerox Palo Alto Research Center, Calif.
STRUCTURE AND ELECTRONIC STUDIES OF DEFECTS IN AMORPHOUS SILICON Final Report, Mar. 1980 - Feb. 1981
R. A. Street Aug. 1981 33 p refs
(Contract DE-AC03-79ET-23033)
(DE81-029977; DOE/ET-23033/T4) Avail: NTIS HC A03/MF A01

Basic research of the structure and electronic properties of a-Si:H is reported with particular emphasis on the role of defects. It was found that low defect density material can be deposited at a high rate using SiH4 diluted in He or Ne (using Ar or Kr results in a high defect density and columnar material). An Electrical bias during deposition modifies the band gap, hydrogen concentration and structure. The clustering of hydrogen in the regions between the columns is confirmed. Hydrogen diffusion is observed. The oxidation of an a-Si:H surface results in approx. 3 x 10(11) cm(-2) dangling bonds at the interface. Auger recombination of photoexcited carriers is a significant non-radiative mechanism at low temperatures. Non-radiative recombination by diffusion and capture at dangling bonds is observed at temperatures above 50 to 1000 K. The defect density in doped and compensated a-Si:H is determined by the position of the Fermi energy. The mechanism for defect incorporation is believed to be autocompensation. DOE

N82-22072# Xerox Palo Alto Research Center, Calif.
STRUCTURAL AND ELECTRONIC STUDIES OF DEFECTS IN AMORPHOUS SILICON Technical Progress Report, May - Jul. 1981
R. A. Street 15 Sep. 1981 25 p refs Prepared in part for Midwest Research Inst.
(Contract DE-AC02-77CH-00178)
(DE82-000225; SERI/PR-9079-1-T4) Avail: NTIS HC A02/MF A01

Current transient deep level transient spectroscopy (DLTS) work was completed. By using both current injection and optical excitation, three peaks in the DLTS spectra were identified at 60, 110, and 200 K. The peaks at 50 and 200 K are interpreted as originating from the drift of electrons and holes respectively. The peak at 110 K represents emission from an electron trap and is related to the peak observed in thermally stimulated conductivity. The structure and electronic properties of silicides include Pt and Au. Platinum forms crystalline Pt2Si and PtSi simultaneously, whereas with Au, an intermixed Au-Si phase grows, which lacks long range order. As the silicide grows, there is an improvement in the identify factors and a modification of the barrier heights. For all three metals, almost ideal Schottky barriers can be formed which are stable. The electrical properties of Pd/a-Si:H Schottky barriers were also studied. DOE

N82-22073# Stanford Univ., Calif. Dept. of Materials Science and Engineering.
PREPARATION AND PROPERTIES OF EVAPORATED CdTe FILMS COMPARED WITH SINGLE CRYSTAL CdTe Progress Report, 1 May - 31 Jul. 1981
Richard H. Bube 1981 20 p
(Contracts DE-AC02-77CH-00178; SERI XW-1-9330-1)
(DE82-000228; SERI/PR-9330-1-T3; PR-3) Avail: NTIS HC A02/MF A01

The hot wall vacuum deposition system is discussed and is is good temperature tracking between the furnace core and the CdTe source itself are indicated. Homojunction cells prepared by HWVE deposition of n-CdTe on p-CdTe substrates show no significant change in dark or light properties after open circuit storage for the next 9 months. CdTe single crystal boules were grown with P, As and Cs impurity. For P impurity it appears that the segregation coefficient is close to unity, that the value of hole density is controlled by the P, and that growth with excess Cd gives slightly higher values of hole density than growth with excess Te. CdTe:As crystals appear similar to CdTe:P crystals. DOE

N82-22074# Grenoble Univ. (France).
STUDY OF ELEMENTARY POINT DEFECTS AND OF THE DYNAMIC OF DEFECTS ASSOCIATED TO IRRADIATION IN ALPHA AgZn SOLID SOLUTIONS Ph.D. Thesis
Daniel Beretz Nov. 1980 162 p refs In FRENCH
(FRNC-TH-1007) Avail: NTIS (US Sales Only)
HC A08/MF A01; DOE Depository Libraries

After briefly recalling the structural defects created in a crystal lattice during irradiation and the evolution in the concentrations of defects under irradiation, some particulars are given respecting the parameters which describe the relaxation defects associated with the short distance variations of the order brought about by applied stress, and the mechanical hauling appliances developed for effecting measurements in a pool reactor, and in line behind a Van de Graaff accelerator, as well as on the irradiation conditions. The results are presented of the comparative study of the effects of gamma radiation irradiation, of fast electrons, reactor neutrons, and 14 MeV neutrons made on the same alloy namely: Ag - 24% atomic Zn. The aspect specific to the cascades of atomic movements brought about by the neutron bombardment are emphasized: asymmetry of the emission of vacancies and auto-interstitials and production of holes by the collapse of the cascades. The results relative to the mobility of the vacancies and auto-interstitials are presented. The entire range of the alpha-AgZn solid solutions extending from pure silver to the levels next to the thirty percent atomic of zinc is covered. Finally the very marked slowing down of the auto-interstitial observed in this system is discussed in terms of the effect of the zinc level of the measured mobility parameters. DOE

N82-22075 Iowa State Univ. of Science and Technology, Ames.
A LATTICE MODEL FOR THE ELECTRIC DOUBLE LAYER Ph.D. Thesis
Andrew Steele Peterson 1981 75 p
Avail: Univ. Microfilms Order No. 8128849

The layer of an electrolyte adjacent to the metal surface is described. A model is presented to treat the simple case where this layer consists entirely of water molecules. Approximations that include more than simple mean field effects are used to treat the interactions between the molecules. The effects of local order produce significant qualitative changes in the predicted inner layer differential capacitance curves. At inner layer thickness variation proportional to the net orientation of the molecules in the layer is proposed. With this thickness dependence it is possible to obtain good agreement between the predictions of the model and the experimentally inferred inner layer capacitance curves of the water inner layer and mercury electrodes. Dissert. Abstr.

N82-22076 Pennsylvania State Univ., University Park.
CURRENT-CONTROLLED NON-EQUILIBRIUM PROCESSES AT METAL SEMICONDUCTOR CONTACTS Ph.D. Thesis
Saeid Rahimi 1981 129 p
Avail: Univ. Microfilms Order No. 8129203

A unified formulation of the four nonequilibrium phenomena in semiconductors (injection, exclusion, accumulation and extraction) is presented through solutions to the transport equations in the realm of a small signal theory. No simplifying assumptions are made beyond linearization. The solutions are valid for lifetime as well as relaxation semiconductors. The solutions also provide a quantitative assessment of the effect of minority carrier traps. Expressions are obtained for the excess majority and minority carrier concentrations for the electric field, as functions of distance from an injecting boundary and also as functions of the fixed parameters of the material, e.g., carrier mobilities and lifetime. The small signal injection and extraction results are supported by measurements on single crystal Ge, before and after fast neutron bombardment (to introduce traps). Large signal experimental results for minority carrier extraction were obtained, and are in agreement with analysis. Dissert. Abstr.

N82-22077 Princeton Univ., N. J.
PHONON COUPLING IN TUNNELING SYSTEMS AT ZERO

TEMPERATURE: AN INSTANT ON APPROACH Ph.D. Thesis
James Paterasp Sethna 1981 126 p
Avail: Univ. Microfilms Order No. 8129298

A method for dealing with phonon modes in path integrals is presented. Using it and an instanton expansion, a detailed theory of the tunneling event in the presence of phonons was developed. An instanton expansion was used to compute tunnel splittings and decay times for the coupled system, and the results were compared with traditional two level models for point tunneling defects in solids. For electron tunneling with a weak phonon coupling, the two level models are found to be adequate. For atomic tunneling and strongly coupled electronic tunneling (i.e., where self trapping is a component of the effective potential) the two level models can be used, if at all, only in a renormalized sense. As noted, the two level truncation approximation is natural in dealing with tunneling of weakly coupled electrons. Atomic tunneling is demonstrably best described by an effective mass due to the coupled lattice motion. Strongly coupled electrons are treated using an approximation valid for self trapped tunneling. In the same vein, a renormalized truncation approximation is developed which explains the successes and failures of the use of two level systems to describe tunneling. Dissert. Abstr.

N82-21996# Joint Publications Research Service, Arlington, Va.
NEW DONOR IN ANNEALED SILICON STUDIED
Xu Zhenjia, Sun Bokang, Wang Wannian, Zhang Zehua, Liu Jiangxia, and He Guangping *In its* China Rept.: Sci. and Technol., No. 153 (JPRS-80348) 18 Mar. 1982 p 6-15 refs Transl. into ENGLISH from Acta Electron. Sinica (Beijing), no. 6, 1981 p 58-63 (For primary document see N82-21995 12-70)
Avail: NTIS HC A04/MF A01

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N82-22078*# Yale Univ., New Haven, Conn. Dept. of Physics.
DEVELOPMENT OF A DIRECT EXPERIMENTAL TEST FOR ANY VIOLATION OF THE EQUIVALENCE PRINCIPLE BY THE WEAK INTERACTION Final Report
Peter D. MacD. Parker 7 Dec. 1981 29 p refs
(Contract NAS8-33572)
(NASA-CR-161984; NAS 1.26:161984) Avail: NTIS HC A03/MF A01 CSCL 20J

Violation of the equivalence principle by the weak interaction is tested. Any variation of the weak interaction coupling constant with gravitational potential, i.e., a spatial variation of the fundamental constants is investigated. The level of sensitivity required for such a measurement is estimated on the basis of the size of a change in the gravitational potential which is accessible. The alpha particle spectrum is analyzed, and the counting rate was improved by a factor of approximately 100. S.L.

N82-22079# Centre National de la Recherche Scientifique, Marseilles (France). Centre de Physique Theorique.
STATIONARY SCATTERING THEORY
J. M. Combes Oct. 1980 29 p refs Presented at the Rigorous Atomic and Molecular Phys., Erice, Sicily, Jun. 1981
(CNRS-CPT-80-P-1249) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The stationary scattering theory, a complementary approach to the time dependent scattering theory for one body Schroedinger operators is presented. The stationary theory is concerned with objects of quantum theory like scattering waves and amplitudes. In abstract stationary theory is generalized form of the Lippman-Schwinger equation plays the basic role. Solving this equation leads to a linear map between generalized eigenfunctions of the perturbed and unperturbed operators. This map is the section at fixed energy of the wave operator from the time dependent theory. It is shown that the radiation holds a posteriori in a variety of situations thus restoring the link with physical theories. DOE

N82-22080# Lyon Univ. (France).
THERMODYNAMIC STUDY OF THE INJECTION OF STEAM BUBBLES IN A SUBCOOLED LIQUID Ph.D. Thesis
Jacqueline Besset Oct. 1980 90 p refs In FRENCH
(FRNC-TH-999) Avail: NTIS (US Sales Only) HC A05/MF A01; DOE Depository Libraries

The behavior of steam bubbles injected in subcooled liquid was studied. Water was the fluid chosen for this experiment for the steam and the liquid. The experiment was carried out at atmospheric pressure and the variable parameters were the (radical)T subcooling (difference between the saturation temperature at the pressure under consideration and that of the liquid) around the bubbles: and the steam output. The formation of the bubbles was first studied in a wide subcooling range. A straight correlation was obtained giving the volume of the bubbles formed at the injector outlet, which is valid for a wide range of variables. The implosion of free bubbles in the liquid after they separated from the injector was then studied. In these experiments the significant implosion parameters are the Jakob Ja number, that measures the possibility of the liquid to absorb the heat given off by the condensation, and the Peclet Pe(RO) number, that defines the relative participation of conduction and convection in the heat exchanges. These numbers vary in the areas; 35 Ja < 180; 7000 < Pe(RO) < 60000. DOE

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N82-22081*# National Aeronautics and Space Administration, Washington, D. C.
THE SPACELAB PROJECT: A TRANSATLANTIC CHALLENGE FOR EUROPE
Dieter R. Ottemeyer Dec. 1981 17 p Transl. into ENGLISH from Astronautik (West Germany), v. 13, no. 3, 1976 p 57-60 Translation announced as A76-43294 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by ERNO Raumfahrttechnik GmbH, Bremen
(Contract NASw-3541)
(NASA-TM-76656; NAS 1.15:76656) Avail: NTIS HC A02/MF A01 CSCL 22A

The contribution of Europe to the U.S. space program is related to the development of Spacelab. The Federal Republic of Germany is to contribute 53% and Italy 18% of the expenses. The industrial team conducting the development work for the Spacelab consists of experts from firms of the ten nations participating financially in the program. Attention is given to organizational problems, details on the development program, aspects of mission preparation, and future developments. R.J.F.

N82-22082# Committee on Science and Technology (U. S. House).
RISK: ASSESSMENT, ACCEPTABILITY AND MANAGEMENT
Washington GPO 1981 122 p Rept. presented to the Subcomm. on Sci., Res. and Technol. Transmitted to the Comm. on Sci. and Technol., 97th Congr., 1st Sess., Nov. 1981 Prepared by

Congressional Research Service, Library of Congress
(GPO-87-593) Avail: Subcomm. on Sci., Res. and Technol.

Risk assessment, particularly of risks to the public health resulting from government and industry decisions, is discussed. Cost/benefit analysis as applied to such situations as human deaths and the contracting of cancer by humans is discussed. The role of government regulations and standards is discussed.
R.J.F.

N82-22083# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va. Human Factors Technical Area.
A DECISION SUPPORT FRAMEWORK FOR DECISION AID DESIGNERS Final Technical Report
Ruth H. Phelps, Stanley M. Halpin, and Edgar M. Johnson Jan. 1981 24 p refs
(DA Proj. 2Q1-62717-A-790)
(AD-A110329; ARI-TR-504) Avail: NTIS HC A02/MF A01 CSCL 05/1

A Decision Support Framework is presented which serves two purposes: first, to organize and integrate various decision aids according to their function, and secondly to provide the decision aid designer with a systematic context in which to develop decision aids as well as examine which aspects of the decision problem would most benefit from decision aiding. The main components of the framework are discussed in detail with Army intelligence decision making examples: (1) analysis of the decision requirements; (2) development of decision aids to provide the decision maker with information as well as tools for evaluating, weighting and integrating the information to make a decision; and (3) evaluation of the success of the decision aids in leading to a logical, rational decision. GRA

N82-22084# Oklahoma Univ., Norman. Decision Processes Lab.
DESCRIBING THE REPRESENTATION OF DECISION PROBLEMS: AN APPLICATION OF MULTIDIMENSIONAL SCALING AND CLUSTER ANALYSIS
Carol A. Manning 15 Dec. 1981 53 p refs
(Contract N00014-80-C-0639; NR Proj. 197-066)
(AD-A110175; TR-15-12-81) Avail: NTIS HC A04/MF A01 CSCL 05/10

Important representations for an example of a common class of decision problems facing a shortage of a commodity are described. Decision problems are typically ill-structured, and a decision maker's representation of a problem is not obvious to the experimenter. The dimensions along which a group of subjects judged the similarity of potential solutions to a problem gives insight into various ways in which the problem may be represented. Multidimensional scaling and cluster analysis were used to analyze the similarity of 43 acts suggested to solve the parking problem at the University of Oklahoma. Hierarchical cluster analysis was used to analyze the similarity judgments to examine neighborhoods of acts in the three dimensional space to determine whether an alternative interpretation of the relationships between acts might be obtained. Seven clusters were identified. The three dimensions derived from multidimensional scaling and the set of clusters obtained from cluster analysis describe alternative strategies for solving the parking problem from which individual decision makers sample when representing the problem. E.A.K.

N82-22085# Raven Systems and Research, Inc., Atlanta, Ga.
MICRORESOURCE ESTIMATION RESEARCH PROJECT, PHASE 4 Final Report
Dec. 1981 14 p
(Contract DAAK70-78-D-0052)
(AD-A110248) Avail: NTIS HC A02/MF A01 CSCL 05/1

Microestimation is a technique by which system analysts predict the manpower requirements needed to make changes to computer programs. During the past three years, Raven Systems and Research has conducted several studies related to microestimation, and it has recently developed a prototype Automated Microestimation Systen (AMS). This report is provided to accompany the delivery of the AMS. It is both a description of the new system and a summary of research to date. This report consists of four parts: (1) The history of the microestimation study, including significant conclusions; (2) AMS development and overall design and operation; (3) Questions related to interfacing AMS with several other systems either currently in existence or under development, and (4) Several general problems related to microestimation, brought to light as a result of the entire microestimation study. Part 4 also makes recommendations for further development and research related to the AMS and microestimating in general. GRA

N82-22086# Naval Postgraduate School, Monterey, Calif.
PROPOSED SYSTEM FOR THE USE OF EVALUATION FACTORS IN THE SOURCE ELECTION OF SERVICE CONTRACTORS M.S. Thesis
Richard Douglas Pingel Sep. 1981 114 p refs
(AD-A109686) Avail: NTIS HC A06/MF A01 CSCL 05/1

Technical personnel are increasingly being required to perform vital functions as proposal evaluators in the source selection process for which they have not properly been trained. This research effort provides a comprehensive system for source selection using price and other factors in a form aimed at the technical professionals that support field acquisition activities. All examples selected are from the general acquisition area of service contracting. The system consists of the basic considerations necessary for preparation of a procurement request, the basic elements of a source selection plan, selection of a technical evaluation panel, selection of evaluation factors for service contractors, preparation of negotiation objectives, the actual conduct of evaluations and negotiations, and debriefing of unsuccessful offerors. Author (GRA)

N82-22087# Carnegie-Mellon Univ., Pittsburgh, Pa. Management Sciences Research Group.
A NETWORK APPROACH TO CONSORT PERSONNEL PLANNING USING CROSS SECTIONAL DATA
R. Shantha Mohan, Cheryl Gaimon (Ohio State Univ.), and Gerald L. Thompson Oct. 1981 17 p refs
(Contract N00014-80-C-0151)
(AD-A110808; MSRR-478) Avail: NTIS HC A02/MF A01 CSCL 05/9

The control theory cohort approach of Gaimon and Thompson is formulated as a network model. The basic notation is defined. With reference to a network diagram, the objective function and the constants of the basic model are introduced. An example of the formulation is presented. N.W.

N82-22088# Admiralty Marine Technology Establishment, Teddington (England).
STRATEGIES OF COMMAND DECISION MAKING
E. H. I. Wheately May 1981 19 p refs
(AMTE(E)-TM-81101; BR79602) Avail: NTIS HC A02/MF A01

The theoretical and psychological literature on decision making was reviewed. A design route to a true man centered system through a full functional analysis of requirements, identifying the sorts of decisions that must be made is advised. A distinction is made between functions amenable to problem solving algorithms, e.g., weapon allocation routines, and functions amenable to the use of decision making heuristics, e.g., choice of search strategies. The latter can then be matched to known decision aiding techniques. Decisions are divided into: probabalistic judgements; choice behavior; and dynamic decision making. Redesign of display facilities, processing with user friendly aids, or choice aids to group decision making using multiattributed utility theory, are suggested. Author (ESA)

N82-22089# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Raumfahrt.
PLANNING AND MANAGEMENT OF RESEARCH AND DEVELOPMENT PROJECTS: PROBLEMS AND MEASURES TAKEN [PLANUNG UND UEBERWACHUNG VON F UND E - PROJEKTEN: PROBLEME UNE MASSNAHMEN]
B. Madauss 1 Oct. 1981 36 p In GERMAN
(MBB-UR-570/81-OE) Avail: NTIS HC A03/MF A01

Detailed planning of production management systems are reviewed. The organization of integrated, aerospace project status control procedures is considered as an example. Conceptual, project phases are identified, like system proposal, specification, and preliminary design followed by critical design, first article configuration inspection, and system production review. At each phase, problems are reduced to technology, deadlines, or costs.

Management analysis methods are compared: (1) rough order of magnitude, (2) cost estimate parametric relationship, and (3) a detailed planning method or computation from work unit leveling. The cost effectiveness of the methods is assessed.
Author (ESA)

N82-22090# General Accounting Office, Washington, D. C. Accounting and Financial Management Div.
FEDERAL AGENCIES: MAINTENANCE OF COMPUTER PROGRAMS, EXPENSIVE AND UNDERMANAGED
26 Feb. 1981 72 p refs
(PB81-235020; AFMD-81-25) Avail: NTIS HC A04/MF A01 CSCL 05A

The impact that computer program maintenance has on Federal computer operations, and recommendations. The disruptions and expenses caused by software errors and omissions are discussed with the view of saving time and money. Lack of management policies is seen as a major problem. To improve such maintenance are discussed. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N82-22091*# National Aeronautics and Space Administration, Washington, D. C.
MASTER LIST AND INDEX TO NASA DIRECTIVES
1 Feb. 1982 95 p
(NASA-TM-84085; NAS 1.16:84085; NHB-1410.4EE) Avail: NTIS HC A05/MF A01 CSCL 05B

The NASA management directive, delegations of authority, handbooks, and JPL management directives are included. The NASA management directives published in the Code of Federal Regulations, complementary manuals, and safety standards are also listed. An alphabetical index is provided. N.W.

N82-22092# Army TRADOC Systems Analysis Activity, White Sands Missile Range, N. Mex.
PILOT ECONOMIC ANALYSIS OF LIBRARY CIRCULATION SYSTEMS LIBRARY CIRCULATION SYSTEMS
Judy Ann Hawthorne and Noreen M. Stefonek Jun. 1981 128 p refs
(AD-A110307; AD-F050013; TRASANA-TD-26-81) Avail: NTIS HC A07/MF A01 CSCL 05/2

The results of a study which derived the costs and effectiveness of several local manual circulation systems and a vendor supplied automated circulation system are present. Included is a detailed methodology for deriving the operating costs of library services and guidelines from concept development through the initiation of a request for approval to purchase ADPE. GRA

N82-22093# Institute for Defense Analyses, Arlington, Va. Technical Information Services Office.
HOW TO GET IT: A GUIDE TO DEFENSE-RELATED INFORMATION RESOURCES Final Report
Jan. 1982 536 p refs
(Contract MDA903-79-C-0329)
(AD-A110000; IDA-P-1500; IDA/HQ-81-24102-Rev) Avail: NTIS HC A23/MF A01 CSCL 05/2

This guide is intended for all who have to identify or acquire government published or sponsored documents, maps, patents, specifications or standards and other resources of interest to the defense community. The entries are arranged alphabetically, in a single list, by document type, source, acronym, series designation, or short title. Each entry consists of an identification of the item and detailed acquisition information such as source, order forms to use, cost, where indexed, and telephone numbers for additional information. GRA

N82-22094# Wisconsin Univ. - Madison. Dept. of Computer Sciences.
DUPLICATE RECORD ELIMINATION IN LARGE DATA FILES
Dina Friedland and David J. DeWitt Aug. 1981 29 p refs
(Contracts DAAG29-79-C-0165; DAAG29-80-C-0041; DE-AC02-8ER-1092; Grant NSF MCS-78-01721)
(AD-A110052; CSTR-445) Avail: NTIS HC A03/MF A01 CSCL 09/2

This paper addresses the issue of duplicate elimination in large data files in which many occurrences of the same record may appear. A comprehensive cost analysis of the duplicate elimination operation is presented. This analysis is based on a combinatorial model developed for estimating the size of intermediate runs produced by a modified merge-sort procedure. The performance of this merge-sort procedure is demonstrated to be significantly superior to the standard duplicate elimination technique of sorting followed by a sequential pass to locate duplicate records. The results can also be used to provide critical input to a query optimizer in a relational database system.
Author (GRA)

N82-22095# Rolls-Royce Ltd., Derby (England).
THE BENEFITS OF DATA EXCHANGE
J. R. Fawn 1980 14 p
(PNR-90048) Avail: NTIS HC A02/MF A01

The analysis of operational data and its use in forecasting engine performance is promoted as a cost effective way to identify needed manufacturer engincering action, shop repair policy, and line maintenance policy. Emphasis is placed on the modular large fan engine. The engine manufacturer needs data concerning aircraft utilization, reliability of aircraft, engines, components and systems, as well as safety, engineering and shop data. The need for a standard format is mentioned. A forecasting model for component failure is briefly described for the RB211 engine. Author (ESA)

N82-22096# Admiralty Marine Technology Establishment, Teddington (England).
READABILITY AND THE PRODUCTION OF INSTRUCTIONAL TEXT IN THE ROYAL NAVY
B. A. Brooking London HMSO Nov. 1980 92 p refs
(AMTE(E)-R-80103; BR77107) Avail: NTIS HC A05/MF A01

Readability is defined and reasons for development are outlined. The results of a survey to assess knowledge of readability in training establishments are reported. The nature of reading and factors affecting comprehension are considered, while methods of assessing readability are examined in detail. It is proposed that present methods of writing and designing instructional text in the Royal Navy can be improved. However, it is recognized that there is no single best method of writing and measuring the effectiveness of text. A compromise solution is recommended, involving the adoption of a general but systematic approach. This could be implemented by the development of a practical course and guide based on research fingings for improving written communication. A review of guidelines for the production of instructional text based on empirical research is presented along with an outline of a proposed writer's production checklist or job aid. Author (ESA)

N82-22097# National Bureau of Standards, Washington, D.C. Inst. for Computer Sciences and Technology.
PROCEEDINGS OF THE COMPUTER PERFORMANCE EVALUATION USER'S GROUP (CPEUG) MEETING (17TH): INCREASING ORGANIZATIONAL PRODUCTIVITY Final Report
Terry W. Potter, ed. Nov. 1981 343 p refs Conf. held in San Antonio, 16-19 Nov. 1981
(PB82-129438; NBS-SP-500-83; LC-81-600155) Avail: NTIS HC A15/MF A01 CSCL 05B

The proceedings reflects the critical role of information services in the productivity, and survival of today's organization, as well as such trends as increasing personnel costs, limited budgets, and the convergence of data processing, communications, and word processing technologies. The program was divided into three parallel sessions and included technical papers on previously unpublished works, case studies, tutorials and panels. GRA

N82-22098# National Bureau of Standards, Washington, D.C. Center for Programming Science and Technology.

COSTS AND BENEFITS OF DATABASE MANAGEMENT: FEDERAL EXPERIENCE
Jesse M. Draper Nov. 1981 110 p refs
(PB82-128869; NBS-SP-500-84; LC-81-600152) Avail: NTIS HC A06/MF A01 CSCL 05B

The Federal Government has a large investment in a wide variety of database management systems (DBMS's) and in diverse applications using those systems. The amount of cost/benefit analysis an agency needs before deciding to buy a DBMS increases with the complexity of the application. The experiences of the interviewed agencies, together with a structured list of cost/benefit parameters, should help Federal managers in understanding the potential value of DBMS technology and in defining their requirements for data management. Author (GRA)

N82-22099# Committee on Information Hang-Ups, Washington, D.C. Energy Systems Group.
DIRECTORY OF ENERGY AND ENVIRONMENT LIBRARIES AND INFORMATION CENTERS IN THE METROPOLITAN WASHINGTON D.C. AREA
Ellen L. Berman 1981 162 p
(PB82-123993) Avail: NTIS HC A08/MF A01 CSCL 05B

Information on the resources, services, and policies of each library and information center is provided. The directory is arranged alphabetically by name of parent organization. Indexes to key staff members, subject coverage, types of material, and online search services are included. Terms in the subject index conform to the subject list in the questionnaire (Appendix A). The index to Types of Material draws its terms form a list in the RESOURCES section of the questionnaire. GRA

N82-22100# National Academy of Sciences - National Research Council, Washington, D. C. Assembly of Mathematical and Physical Sciences.
NUMERICAL DATA ADVISORY BOARD REPORT OF ACTIVITIES PERFORMED FOR THE PERIOD JULY 1, 1980 - JUNE 30, 1981 Annual Report, 1 Mar. - 31 Aug. 1981
G. C. Carter 1981 33 p Sponsored in cooperation with NBS, EPA, DOD and DOE
(Grant NSF IST-80-19605)
(PB82-134545) Avail: NTIS HC A03/MF A01 CSCL 05B

The objectives of the numerical data advisory board (NDAS) which is the improvement in quality, reliability, availability, accessibility, dissemination, utilization, and management of data are discussed. NDAB promotes an appreciation of the importance of evaluated data to scientists, engineers, regulators, and others who require reliable numerical data for research and for decision making. GRA

N82-22101# Michigan Univ., Ann Arbor. Mental Health Research Inst.
LINKS OF INTEREST AND EXPERTISE AMONG SCIENTISTS Final Report, 1 Oct. 1978 - 30 Sep. 1980
Manfred Kochen, Alex Blaivas, Robin Crickman, and D. deSolla Price 4 Feb. 1981 44 p refs
(Grant NSF IST-78-16629)
(PB82-130360) Avail: NTIS HC A03/MF A01 CSCL 05B

The main aims of the project on links of interest and expertise among scientists were to: (1) describe the network used by scientists in choosing peers; (2) study the way scientific clusters, define themselves; (3) recommend improved ways to describe interest and expertise and to use the network. A pair of nonlinear differential equations were used to model the growth of two interacting specialties, econometrics and artificial intelligence to analyze the effect of information on planning expert selection, scholarly communication, and the interaction of libraries and publishers. GRA

N82-22102# Forecasting International Ltd., Arlington, Va.
THE POTENTIAL INFLUENCE OF SOCIAL, ECONOMIC, REGULATORY AND TECHNOLOGICAL FACTORS ON SCIENTIFIC AND TECHNICAL COMMUNICATION THROUGH 2000 A.D. VOLUME 1: THE FORECAST Final Report, 1 Sep. 1978 - 31 Aug. 1981
Audrey Clayton 1 Sep. 1981 145 p refs 2 Vol.
(Grant NSF IST-78-12102)
(PB82-129917) Avail: NTIS HC A07/MF A01 CSCL 05B

The future of scientific and technical communication and the various factors which may influence its course of evolution are addressed. The current status of this type of communication is reviewed and existing trends are highlighted based upon an analysis of historic progression. The impacts of potentially perturbing factors are traced in case studies of bibliographic retrieval services and computer conferencing. The point of view taken is that of the 'user', defined as an individual who initiates or is the intended recipient of the communication of scientific and technical information. Key policy issues are identified, and the implications of the study findings for decision-makers in government and industry are examined. GRA

N82-22103# Forecasting International Ltd., Arlington, Va.
THE POTENTIAL INFLUENCE OF SOCIAL, ECONOMIC, REGULATORY AND TECHNOLOGICAL FACTORS ON SCIENTIFIC AND TECHNICAL COMMUNICATION THROUGH 2000 A.D. VOLUME 2: THE PROCESS Final Report
Audrey Clayton 1 Sep. 1981 46 p refs 2 Vol.
(Grant NSF IST-78-12102)
(PB82-129925) Avail: NTIS HC A03/MF A01 CSCL 05B

This volume contains a detailed account of the project history, which addresses both the substantial progress and the problems encountered. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N82-22104*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GAMMA-RAY ASTRONOMY
R. Ramaty and R. E. Lingenfelter (California Univ., La Jolla) Mar. 1982 60 p refs Submitted for publication
(NASA-TM-83905; NAS 1.15:83905; Rept-665) Avail: NTIS HC A04/MF A01 CSCL 03A

Cosmic gamma rays, the physical processes responsible for their production and the astrophysical sites from which they were seen are reported. The bulk of the observed gamma ray emission is in the photon energy range from about 0.1 MeV to 1 GeV, where observations are carried out above the atmosphere. There are also, however, gamma ray observations at higher energies obtained by detecting the Cerenkov light produced by the high energy photons in the atmosphere. Gamma ray emission was observed from sources as close as the Sun and the Moon and as distant as the quasar 3C273, as well as from various other galactic and extragalactic sites. The radiation processes also range from the well understood, e.g. energetic particle interactions with matter, to the still incompletely researched, such as radiation transfer in optically thick electron positron plasmas in intense neutron star magnetic fields. E.A.K.

N82-22105# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
MODELING AND SOLUTION TECHNIQUES FOR ADVANCED ECONOMIC ANALYSIS Ph.D. Thesis - Arizona State Univ.
John H. Estes, IV Dec. 1981 213 p refs
(AD-A110097; AFIT-CI-81-66D) Avail: NTIS HC A10/MF A01 CSCL 05/3

Both the cash flow and the timing of a cash flow are often found to be random variables in economic analysis. Very few analytical tools exist to handle such problems. This research develops analytical tools to aid in the analysis of such problems. A total of 16 basic models are developed for impulsive, single cash flows and series cash flows involving capital investment problems with mutually exclusive alternatives. Each model is developed under the assumption of deterministic, constant interest rates. In addition to the development of models where cash flow and timing of cash flow are independent, dependent models are also presented. The use of these model elements by an analyst will allow the utilization of available data in a more

realistic and accurate mode. The models are also of significant worth in verifying simulation output. GRA

N82-22106# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computer Science.
OPTIMIZATION PROGRAMS FOR ECONOMIC ENERGY MODELLING PROBLEMS
Susan M. Hodson Oct. 1981 43 p refs
(Contract EEC-680-79-1-EM-UK)
(NPL-DNACS-51/81; EUR-7548-EN; ISSN-0143-7348) Avail: NTIS HC A03/MF A01

The use of MINOS and MINOS/AUGMENTED programs in linear programming and nonlinear optimal control models is described. The programs take advantage of general sparsity in the matrix of first derivatives of the constraints, which allows the solution of large problems, like finding the optimal fuel-mix and investment proposals to minimize the overall discounted cost covering all the supply utilization sectors of the energy system on a multinational, multiperiod scale. A model is used which predicts aggregate final energy demand and aggregate costs for the European economies over a 10 yr period. Author (ESA)

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

N82-22107*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RESEARCH AND TECHNOLOGY 81 Annual Report, Fiscal Year 1981
1981 76 p
(NASA-TM-84164; NAS 1.15:84164) Avail: NTIS HC A05/MF A01 CSCL 05A

During fiscal year 1981, the Goddard Space Flight Center continued to contribute to the goals and objectives of the Nation's space program by undertaking a wide variety of basic and applied research, technology developments, data analyses, applications investigations and flight projects. The highlights of these research and technology efforts are described. R.J.F.

N82-22108# Engins Matra, Velizy (France). Service Fiabilite.
APPLICATION OF SAFETY ENGINEERING TECHNIQUES IN THE STUDY OF THE AUTOMATIC PILOTING OF THE VAL TRANSPORTATION SYSTEM [MISE EN OEUVRE DES TECHNIQUES D'ASSURANCE SECURITE DANS L'ETUDE DU PILOTAGE AUTOMATIQUE DU SYSTEME DE TRANSPORT VAL]
F. Ammeux and J. F. Hostein 5 Mar. 1981 8 p In FRENCH
(Note-25638/REQC) Avail: NTIS HC A02/MF A01

A development and test program, intended to demonstrate the safety factor intrinsic to electronic components installed in a public transportation (rail) system, is evaluated. The specifications-of-the-art behind safety engineering methods are discussed. The level of safety necessary for the VAL system is defined. Given electronic circuit reliability criteria, the test techniques are described. Application of this program is seen as assuring maximal automatic pilot safety, while optimization of cost/effectiveness/deadline is achieved. Author (ESA)

N82-22109# Environmental Protection Agency, Washington, D.C. Office of Water Program Operators.
CONVEYANCE, TREATMENT, AND CONTROL OF MUNICIPAL WASTEWATER, COMBINED SEWER OVERFLOWS, AND STORMWATER RUNOFF: SUMMARIES OF TECHNICAL DATA
10 Feb. 1981 92 p
(PB82-131533; EPA-430/9-81-008; EPA/FRD-23) Avail: NTIS HC A05/MF A01 CSCL 13B

This report is a part of the 1980 Needs Survey report and is a supplement to the cost estimate report to Congress (PB81-193625 entitled '1980 Needs Survey - Cost Estimates for Construction of Publicly-Owned Wastewater Treatment Facilities') dated February 10, 1981. It provides detailed summaries of present and future needs for sewage treatment facilities by State. GRA

N82-22110# Environmental Protection Agency, Washington, D.C. Office of Solid Waste.
REFUSE MANAGEMENT IN DEVELOPING NATIONS
John Thompson Aug. 1981 29 p
(PB82-127697) Avail: NTIS HC A03/MF A01 CSCL 13B

Planning and organizing the collection and disposal refuse in developing nations is discussed. Various methods of collection such as bulk bins and household refuse, types of equipment used and the costs for each type are described. Other pertinent information on life cycle costing, maintenance needs, contract collection, transfer stations, incineration and composing is also presented. GRA

N82-22111# Public Technology, Inc., Washington, D. C.
URBAN CONSORTIUM Final Report
J. K. Parker 1981 10 p
(Grant NSF ISP-78-12729)
(PB82-122789; NSF/ISP-81020) Avail: NTIS HC A02/MF A01 CSCL 13B

Needs and priorities were assessed for the areas of transportation, community and economic development, and management, finance and personnel were evaluated. Workshops were conducted to (1) assess the condition of urban infrastructure and developing future policies; and (2) study the use of emerging energy technologies in urban management. A study of multi-year revenue and expenditure forecasting and a study on the use of fire data were made. City-led research projects included evaluating landfill gas as an energy source; developing methodology for energy impact analysis of community development projects; developing a primary urban energy planning methodology handbook; and retrofitting municipal buildings with solar energy systems. GRA

88 SPACE SCIENCES (GENERAL)

N82-22112*# Lewis (John S.) Associates, Inc., Natick, Mass.
PLANETARY ATMOSPHERES PROGRAM Final Technical Report, 2 Feb. 1981 - 2 Feb. 1982
2 Feb. 1982 48 p refs
(Contract NASw-3477)
(NASA-CR-168728; NAS 1.26:168728) Avail: NTIS HC A03/MF A01 CSCL 03B

Chemical and physical models of the Jovian subnebula are addressed. Halide cloud condensation and volatile element inventories on Venus and considered. Computation methods for isolated grain condensation behavior are examined. For individual titles, see N82-22113 through N82-22115.

N82-22113*# Lewis (John S.) Associates, Inc., Natick, Mass.
CHANNEL AND PHYSICAL MODELS OF THE JOVIAN SUBNEBULA Final Report **c91**
John S. Lewis *In its* Planetary Atmospheres Program 2 Feb. 1982 p 4-26 refs (For primary document see N82-22112 12-88)
Avail: NTIS HC A03/MF A01 CSCL 03B

A semiempirical physical model of the Jovian subnebula was developed by analogy with the primitive solar nebula itself. The

chemical aspects of this model are developed according to the principles developed in the study of the thermochemistry and gas kinetic behavior of the solar nebula, but with important modifications to take into account the higher pressures and densities in the Jovian subnebula. The bulk compositions and densities of the inner satellites of Jupiter are calculated. It is proposed that Europa differs from Io chiefly in that in has suffered a less severe thermal history. The general features of this model are applicable with minor modification to the systems of Saturn and Uranus. N.W.

N82-22114*# Lewis (John S.) Associates, Inc., Natick, Mass.
VENUS: HALIDE CLOUD CONDENSATION AND VOLATILE ELEMENT INVENTORIES **c91**
John S. Lewis and Bruce Fegley, Jr. (Harvard College Observatory) *In its* Planetary Atmospheres Program 2 Feb. 1982 p 27-35 refs (For primary document see N82-22112 12-88)
Avail: NTIS HC A03/MF A01 CSCL 03B

Several Venus cloud condensates, including A12C16 as well as halides, oxides and sulfides of arsenic and antimony, are assessed for their thermodynamic and geochemical plausibility. Aluminum chloride can confidently be ruled out, and condensation of arsenic sulfides on the surface will cause arsenic compounds to be too rare to produce the observed clouds. Antimony may conceivably be sufficiently volatile, but the expected molecular form is gaseous SbS, not the chloride. Arsenic and antimony compounds in the atmosphere will be regulated at very low levels by sulfide precipitation, irrespective of the planetary inventory of As and Sb. Thus the arguments for a volatile-deficient origin for Venus based on the depletion of water and mercury (relative to Earth) cannot be tested by a search for atmospheric arsenic or antimony. Author

N82-22115*# Lewis (John S.) Associates, Inc., Natick, Mass.
ISOLATED GRAIN CONDENSATION BEHAVIOR: COMPUTATION METHODS AND FIRST RESULTS Final Report **c90**
John S. Lewis *In its* Planetary Atmospheres Program 2 Feb. 1982 p 36-47 (For primary document see N82-22112 12-88)
Avail: NTIS HC A03/MF A01 CSCL 03B

A set of efficient programs for calculation of condensation behavior in a system with either solar or carbon-rich elemental composition was developed to treat the course of condensation at very low pressures. These programs were applied to the problem of condensation at very low pressures. The minerals produced in the stellar and nova-related processes under study, including carriers of important volatile elements such as carbon and nitrogen, are candidates for accretion into meteorite parent bodies and planets, and may still be discernible in the enstatite chondrites. N.W.

N82-22116# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
[ACTIVITIES OF THE INSTITUTE FOR EXTRATERRESTRIAL PHYSICS] Annual Report, 1980 [TAETIGKEITSBEREICH 1980]
Jan. 1981 103 p refs In GERMAN Original contains color illustrations
(MPI-PAE/Extraterr-164; ISSN-0340-8922) Avail: NTIS HC A06/MF A01

Research in astrophysics is reported. Topics include: (1) articles and fields in the solar system (ionosphere and northern lights, magnetosphere and solar wind, energetic particle radiation); (2) infrared astronomy (astronomical observations, development of observation systems, theoretical work); (3) X-ray astronomy (astronomical observations and observation systems in the X-ray domain, laboratory research and measurements, theoretical work); (4) gamma ray astronomy (investigation of flare and burst events in the gamma radiation domain, (compton telescope, high energy gamma astronomy); and (5) laboratory spectroscopy (nonlinear optics and coherent vacuum UV light sources, molecular spectroscopy, theoretical work). Author (ESA)

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N82-22117 Academy of Sciences (USSR), Moscow. Space Research Inst.
RADIOINTERFEROMETRIC OBSERVATIONS OF THE SOURCES AT 18 cm WAVELENGTH
L. I. Matveyenko, V. I. Kostenko, A Kh. Paptzenko, N. Bartle, D. Romney, I. G. Moiseev, A. Ficarra, L. Padrielly, L. Booth, K. Weiler et al 1981 20 p refs
(Rept-644) Copyright. Avail: Issuing Activity

On Febraury 14-15, 1980 the angular structure of 33 compact radiosources was investigated with the global network of radiointerferometers at 18 cm. The angular resolution ranged from 3 to 45 m sec of arc. Calibration was carried out reference to NRAO 190 source. The structure of OQ208, OJ287 and OR017 sources are given. Author

N82-22118# Royal Observatory, Edinburgh (Scotland).
[VISIBLE AND INFRARED ASTRONONY IMAGE PROCESSING ACTIVITIES FOR 1978-1979] Annual Report
1980 36 p refs
(ISSN-0309-0108; ISBN-0-902553-23-2) Avail: NTIS HC A03/MF A01

Progress made in hardware and software development for the COSMOS microdensitometer and other optical equipment is described. Commissioning of the infrared telescope in Hawaii and observation program with the UK Schmidt telescope in Australia are reviewed. Research activities are outlined in Milky Way studies, photographic techniques, interplanetary and interstellar media, the structure, content and distribution of distant galaxies and quasars. Author (ESA)

N82-22119# Royal Greenwich Observatory, Herstmonceux (England).
[ASTRONOMICAL ACTIVITIES FOR THE PERIOD OCTOBER 1, 1978 TO SEPTEMBER 30, 1979] Annual Report
G. A. Wilkins, ed. and B. D. Yallop, ed. 1980 56 p refs
(ISSN-0308-3322) Avail: NTIS HC A04/MF A01; Roy. Greenwich Obs., Herstmonceux, England £ 2.50

The telescopes and supporting equipment available at national facilities are described. Research programs are outlined including extragalactic studies, star clusters, variable stars, stellar atmospheres and evolution, galactic astronomy, the solar system, development of astronomical instruments, electronic imaging devices and optical design. Author (ESA)

N82-22120# Deutsches Geodaetisches Forschungsinstitut, Munich (West Germany).
DETERMINATION OF ASTRONOMICAL LONGITUDE DIFFERENCES FOR THE EUROPEAN LONGITUDE REFERENCE SYSTEM FOR 1977 TO 1979 [BESTIMMUNG ASTRONOMISCHER LAENGENDIFFERENZEN FUER DAS EUROPAEISCHE LAENGENNETZ IN DEN JAHREN 1977 BIS 1979]
Klaus Kaniuth and Werner Wende 1980 44 p refs In GERMAN; ENGLISH summary
(Ser-B-250; ISBN-3-7696-8542-3; ISSN-0065-5317) Avail: NTIS HC A03/MF A01

Three series of longitude difference measurements between national reference stations were performed with a Danjon astrolab. The evaluation of the observations on two modes, i.e., the usual adjustment in group as well as a common adjustment of all star transits, is described in detail. From both adjustments, relative right ascension corrections for part of the observed stars and parameters compensating certain systematic and time dependent effects are estimated. The internal accuracies of the derived longitude differences are on the order of + or - 0.001 sec to + or 0.0016 sec. Author (ESA)

N82-22121# Royal Greenwich Observatory, Herstmonceux (England).
[ASTRONOMICAL ACTIVITIES IN THE UNITED KINGDOM] Annual Report, 1 October 1979 to 30 September 1980
G. A. Wilkins, ed. and B. D. Yallop, ed. 1981 54 p refs

(ISSN-0308-3322) Avail: NTIS HC A04/MF A01; Royal Greenwich Obs., Herstmonceux, England £3; PHI

Progress reports on national facilities (La Palma observatory, Steavenson telescope, equatorial group telescopes, measuring machines, and the digital image processing facility) are given. Astronomical research programs are summarized, including work on collapsed objects, cosmic abundances of the elements, galaxies and cosmology, galactic astronomy, stellar evolution and instability, and the solar system. Technical research and development on astronomical instruments, electronic imaging devices, optical design, autoguiders and microprocessing developments are described. National and international services, including the time and latitude service, satellite laser ranging, the stellar reference frame, and other facilities and services, are reviewed.

Author (ESA)

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N82-22122 Academy of Sciences (USSR), Moscow.
THE STAGE OF SUPERHEAVY PARTICLE DOMINANCE IN THE UNIVERSE AND BIG BANG NUCLEOSYNTHESIS
M. Yu. Khlopov and A. G. Polnarev 1981 13 p refs
(Rept-634) Copyright. Avail: Issuing Activity

An independent method for obtaining restrictions on the parameters of superheavy particles, based on the analysis of the p=0 stage effect on the big bang nucleosynthesis, was proposed. The observed abundance of primordial He4 was shown to provide astrophysical restrictions on possible deviations from the dominance of radiation in the big bang universe in the presence of neutron's freezing. Obtained limits together with data on the spectrum of relic radiation were considered in evaluating the dominance of superheavy particles. M.D.K.

N82-22123 Academy of Sciences (USSR), Moscow.
INHOMOGENEITY OF THE EARLY UNIVERSE AND THE FORMATION OF PRIMORDIAL BLACK HOLES
L. S. Marochnik, P. D. Naselsky, and N. A. Zabotin 1980 36 p refs
(Rept-564) Copyright. Avail: Issuing Activity

The problem of primordial black hole creation (PBH) in the early Universe resulting from the collapse of adiabatic inhomogeneities was considered. The stochastic field of perturbations was the main object of consideration. The problem of determination of mass spectrum was formulated in terms of the eruptions of stochastic field f(x,R) being the average of (X,Y,Z) over the volume with the radius R. The abundance of eruptions of Gaussian stochastic field per unit volume was determined. The relation between the parameters of PBH mass spectrum and the amplitude and index m of power spectrum of initial perturbations was also obtained. A discussion of particle accretion on the black holes during their formation is also presented. M.D.K.

N82-22115*# Lewis (John S.) Associates, Inc., Natick, Mass.
ISOLATED GRAIN CONDENSATION BEHAVIOR: COMPUTATION METHODS AND FIRST RESULTS Final Report
John S. Lewis *In its* Planetary Atmospheres Program 2 Feb. 1982 p 36-47 (For primary document see N82-22112 12-88)
Avail: NTIS HC A03/MF A01 CSCL 03B

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N82-22124*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ELECTRON MICROPROBE STUDY OF LUNAR AND PLANETARY ZONED PLAGIOCLASE FELDSPARS: AN ANALYTICAL AND EXPERIMENTAL STUDY OF ZONING IN PLAGIOCLASE Final Report, Feb. 1977 - Sep. 1982
Robert K. Smith (Southern Colorado Univ.) and Gary E. Lofgren 12 Apr. 1982 70 p refs
(Contract NsG-9051)
(NASA-TM-84168; NAS 1.15:84168) Avail: NTIS HC A04/MF A01 CSCL 03B

Natural and experimentally grown zoned plagioclase feldspars were examined by electron microprobe. The analyses revealed discontinuous, sector, and oscillary chemical zoning superimposed on continuous normal or reverse zoning trends. Postulated mechanisms for the origin of zoning are based on either physical changes external to the magma (P, T, H2O saturation) or kinetic changes internal to the magma (diffusion, supersaturation, growth rate). Comparison of microprobe data on natural zoned plagioclase with zoned plagioclase grown in controlled experiments show that it may be possible to distinguish zonal development resulting from physio-chemical changes to the bulk magma from local kinetic control on the growth of individual crystals. A.R.H.

N82-22125*# Atmospheric and Environmental Research, Inc., Cambridge, Mass.
Io: ESCAPE AND IONIZATION OF ATMOSPHERIC GASES Interim Report, 15 Apr. - 15 Oct. 1981
William H. Smyth 15 Oct. 1981 25 p refs
(Contract NASw-3503)
(NASA-CR-168725; NAS 1.26:168725) Avail: NTIS HC A02/MF A01 CSCL 03B

Models for the Io oxygen clouds were improved to calculate the two dimensional sky plane intensity of the 1304 A emission and the 880 A emission of atomic oxygen, in addition to the 6300 A emission intensity. These three wavelength emissions are those for which observational measurements have been performed by ground based, rocket, Earth orbiting satellite and Voyager spacecraft instruments. Comparison of model results and observations suggests that an oxygen flux from Io of about 3 billion atoms sq cm sec is required for agreement. Quantitative analysis of the Io sodium cloud has focused upon the initial tasks of acquiring and preliminary evaluation of new sodium cloud and Io plasma torus data. S.L.

N82-22126*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE VIKING MOSAIC CATALOG, VOLUME 1 Final Report
Nancy Evans Washington NASA Mar. 1982 667 p refs
(Contract NAS7-100)
(NASA-CR-3496-Vol-1; NAS 1.26:3496) Avail: NTIS HC A99/MF A01 CSCL 03B

Martian geographic location information for Viking Orbiter mosaic images is provided. The photographic sequences were chosen based upon image content. The footprinting task was carried out, post factor, in order to facilitate research activities. Early activities were centered around the examination of candidate landing sites. N.W.

N82-22127*# Johns Hopkins Univ., Baltimore, Md. Dept. of Physics.
ULTRAVIOLET SPECTROSCOPY OF COMETS USING SOUNDING ROCKETS, IUE AND SPACELAB
P. D. Feldman 1 Oct. 1981 8 p refs Presented at the Mod. Obs. Tech. for Comets, Greenbelt, Md., 22-24 Oct. 1980 Prepared for JPL
(Grants NGR-21-001-001; NsG-5393)
(NASA-CR-168724; JPL-Pub-81-68) NAS 1.26:168724; Avail: NTIS HC A02/MF A01 CSCL 03B

Information was obtained from the IUE observations as a result of the high spatial resolution capability of the IUE spectrographs and the ability to observe the comet over an extended range of heliocentric distance. The IUE spectrographs also have a high dispersion capability which so far has been used to obtain high resolution spectra of the OH and CS bands. N.W.

N82-22128*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ANTARCTIC METEORITE NEWSLETTER , VOLUME 4, NO. 2

Nov. 1981 26 p refs
(NASA-TM-84163; NAS 1.15:84163) Avail: NTIS HC A03/MF A01 CSCL 03B

Data sheets for a number of meteorites, including achondrites and one iron, are presented. N.W.

N82-22129*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ANTARCTIC METEORITE DESCRIPTIONS 1976-1977-1978-1979
Roberta Score, Carol M. Schwarz, Trude V. V. King, Brian Mason, Donald D. Bogard, and Elizabeth M. Gabel Feb. 1981 160 p
(NASA-TM-84161; JSC-17076; NAS 1.15:84161; Publ-54)
Avail: NTIS HC A08/MF A01 CSCL 03B

All previously distributed meteorite data sheets, plus a number of new ones for 1979 chondrites are included. A comprehensive sample index listing meteorite name/number, classification, and weathering category is also included. Separate indexes listing all petrologic type 3 and type 4 chondrites, all irons, all achondrites, and all carbonaceous chondrites in the collection is provided. N.W.

N82-22130*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ANTARCTIC METEORITE DESCRIPTIONS, 1980
Roberta Score, Carol M. Schwarz, Brian Mason, and Donald D. Bogard Feb. 1982 63 p
(NASA-TM-84162; JSC-18170; NAS 1.15:84162; Publ-60)
Avail: NTIS HC A04/MF A01 CSCL 03B

Specimens found in the Alan Hills area include 361 ordinary chondrites, 4 carbonaceous chondrites, 6 achondrites, and 2 irons. Thirteen specimens measured over 11 cm in diameter and 69 between 5 to 10 cm in diameter are reported. The remainder of the finds were small, and many were paired. One of the irons was estimated to weigh about 20 kilograms. N.W.

N82-22131*# Hawaii Univ., Honolulu. Dept. of Earth and Planetary Sciences.
SPECTROSCOPIC STUDIES OF WATER AND WATER/REGOLITH MIXTURES ON PLANETARY SURFACES AT LOW TEMPERATURES Ph.D. Thesis
Roger Nelson Clark Jan. 1980 340 p refs
(Grant NsG-7323)
(NASA-CR-168732; NAS 1.26:168732) Avail: NTIS HC A15/MF A01 CSCL 03B

New reflectance spectra of Ganymede, Europe, Callisto, Io, Saturn's rings, and Mars were obtained. The new data is combined with data covering other spectral regions for compositional interpretation. The spectral properties of water and mixtures of water plus other minerals were studied in the laboratory at the low temperatures typical of Mars, the Galilean satellites, and Saturn's rings. High precision reflectance spectra of water ice were studied. N.W.

N82-22132*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CHARGED PARTICLE MOTIONS IN THE DISTENDED MAGNETOSPHERES OF JUPITER AND SATURN
Thomas J. Birmingham Feb. 1982 37 p refs
(NASA-TM-83899; NAS 1.15:83899) Avail: NTIS HC A03/MF A01 CSCL 03B

Charged particle motion in the guiding center approximation is analyzed for models of the Jovian and Saturnian magnetospheric magnetic fields based on Voyager magnetometer observations. Field lines are traced and exhibit the distention which arises from azimuthally circulating magnetospheric currents. The spatial dependencies of the guiding center bounce period and azimuthal drift rate are investigated for the model fields. Non-dipolar effects in the gradient-curvature drift rate are most important at the equator and affect particles with all mirror latitudes. The effect is a factor of 10-15 for Jupiter with its strong magnetodisc current and 1-2 for Saturn with its more moderate ring current. Limits of adiabaticity, where particle gyroradii become comparable with magnetic scale lengths, are discussed and are shown to occur at quite modest kinetic energies for protons and heavier ions. A.R.H.

N82-22113*# Lewis (John S.) Associates, Inc., Natick, Mass.
CHANNEL AND PHYSICAL MODELS OF THE JOVIAN SUBNEBULA Final Report
John S. Lewis *In its* Planetary Atmospheres Program 2 Feb. 1982 p 4-26 refs (For primary document see N82-22112 12-88)
Avail: NTIS HC A03/MF A01 CSCL 03B

N82-22114*# Lewis (John S.) Associates, Inc., Natick, Mass.
VENUS: HALIDE CLOUD CONDENSATION AND VOLATILE ELEMENT INVENTORIES
John S. Lewis and Bruce Fegley, Jr. (Harvard College Observatory) *In its* Planetary Atmospheres Program 2 Feb. 1982 p 27-35 refs (For primary document see N82-22112 12-88)
Avail: NTIS HC A03/MF A01 CSCL 03B

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N82-22133*# Arizona Univ., Tucson. Dept. of Physics.
SOLAR DIAMETER MEASUREMENTS FOR STUDY OF SUN CLIMATE COUPLING Final Report, Jun. 1980 - May 1981
Henry A. Hill Sep. 1981 11 p refs
(Contract NAS5-26176)
(NASA-CR-166786; NAS 1.26:166786) Avail: NTIS HC A02/MF A01 CSCL 03B

Variability in solar shape and diameters was examined as a possible probe of an important climatic driving function, solar luminosity variability. The techniques and facilities developed for measuring the solar diameter were used. The observing program and the requisite data reduction were conducted simultaneously. The development of a technique to calibrate the scale in the telescope field progressed to the design and construction phase. J.M.S.

N82-22134*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NUCLEAR PROCESSES IN SOLAR FLARES
R. Ramaty Mar. 1982 70 p refs Repr. from "The Physics of the Sun", Chapter 3
(NASA-TM-83904; NAS 1.15:83904) Avail: NTIS HC A04/MF A01 CSCL 03B

The theory of solar gamma-ray line production is reviewed and new calculations of line production yields are presented. Observations, carried out with gamma-ray spectrometers on OSO-7, HEAO-1, HEAO-3 and SMM are reviewed and compared with theory. These observations provide direct evidence for nuclear reactions in flares and furnish unique information on particle acceleration and flare mechanisms. Author

N82-22135# Air Force Geophysics Lab., Hanscom AFB, Mass. Space Physics Div.
THE ROLE OF THE BIG FLARE SYNDROME IN CORRELATIONS OF SOLAR ENERGETIC PROTON FLUXES AND ASSOCIATED MICROWAVE BURST PARAMETERS Interim Report
S. W. Kahler 21 Sep. 1981 33 p refs
(AF Proj. 4643)
(AD-A109806; AFGL-TR-81-0280; AFGL-ERP-754) Avail: NTIS HC A03/MF A01 CSCL 03/2

In previous studies correlating E > 10 MeV proton fluxes and spectra with various associated microwave burst parameters, the resulting high correlations were assumed to reflect a common acceleration process for the protons and the microwave-emitting electrons. We suggest and test an alternative explanation for these correlations, which we term the Big Flare Syndrome (BFS), that states that, statistically, energetic flare phenomena are more intense in larger flares, regardless of the detailed physics. Peak 1-8 A X-ray fluxes, characteristic of the thermal flare, are correlated with peak proton fluxes to derive correlation coefficients characteristics of the BFS. Of all microwave parameters tested for the 1973-1979 period, only the time-integrated flux densities at 8800 and 15400 MHz may be significantly larger than expected form the BFS. We fail to confirm previous results

associating peak proton spectra with peak microwave spectral characteristics, thus finding no evidence that peak microwave fluxes are indicative of proton acceleration. We extend this conclusion to peak hard X-ray correlations. The strongly nonlinear relationship deduced between flare energy and proton production also appears invalid. Author (GRA)

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N82-22136*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

NEUTRAL HYDROGEN IN ELLIPTICAL GALAXIES WITH NUCLEAR RADIO SOURCES AND OPTICAL EMISSION LINES

L. L. Dressel, T. M. Bania, and R. W. OConnell Jan. 1982 44 p refs Submitted for publication

(NASA-TM-83870; NAS 1.15:83870) Avail: NTIS HC A03/MF A01 CSCL 03B

An H I detection survey of eleven elliptical galaxies with powerful nuclear radio sources was conducted, using the 305 m antenna of Arecibo Observatory, to test the hypothesis that large H I mass is conductive to the formation of nuclear radio sources in elliptical galaxies. The H I was detected in emission in UGC 09114 and was possibly detected in absorption in UGC 06671. Observations of the remaining galaxies were not sensitive enough to support or refute the hypothesis. Data was combined from other H I surveys and spectroscopic surveys to search for correlations of H I mass with other galactic properties and environmental conditions. Strong correlations of (O II) lambda 3727 emission with H I content and with nuclear radio power were found. The latter two properties may simply indicate, respectively, whether a significant amount of gas is available to be ionized and whether energy is provided by nuclear activity for ionization. No dependence of H I content on optical luminosity or on degree of isolation from other galaxies was found. B.W.

N82-22137*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

SPECTRAL EVOLUTION OF ACTIVE GALACTIC NUCLEI: A UNIFIED DESCRIPTION OF THE X-RAY AND GAMMA

Darryl Leiter and Elihu Boldt Feb. 1982 68 p refs Submitted for publication

(NASA-TM-83892; NAS 1.15:83892) Avail: NTIS HC A04/MF A01 CSCL 03B

A model for spectral evolution is presented whereby active galactic nuclei (AGN) of the type observed individually emerge from an earlier stage at z approx = 4 in which they are the thermal X-ray sources responsible for most of the cosmic X-ray background (CXB). The conjecture is pursued that these precursor objects are initially supermassive Schwarzschild black holes with accretion disks radiating near the Eddington luminosity limit. It is noted that after approx. 10 to the 8th power years these central black holes are spun-up to a canonical Kerr equilibrium state (A/M = 0.998; Thorne 1974) and shown how they then can lead to spectral evolution involving non-thermal emission extending to gamma rays, at the expense of reduced thermal disk radiation. That major portion of the CXB remaining after the contribution of usual AGN are considered, while a superposition of AGN sources at $z < 1$ can account for the gamma ray background. Extensive X-ray measurements carried out with the HEAO 1 and 2 missions as well as gamma ray and optical data are shown to compare favorably with principal features of this model. B.W.

N82-22138*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

NEUTRINO MASSES, NEUTRINO OSCILLATIONS, AND COSMOLOGICAL IMPLICATIONS

F. W. Stecker Mar. 1982 63 p refs Presented at the 21st Intern. Universitaetswochen fuer Kernphysik - Winter School on Electroweak Interactions, Schladming, Austria, Feb. - Mar. 1982 Submitted for publication

(NASA-TM-83909; NAS 1.15:83909) Avail: NTIS HC A04/MF A01 CSCL 03B

Theoretical concepts and motivations for considering neutrinos having finite masses are discussed and the experimental situation on searches for neutrino masses and oscillations is summarized. The solar neutrino problem, reactor, deep mine and accelerator data, tri decay experiments and double beta-decay data are considered and cosmological implications and astrophysical data relating to neutrino masses are reviewed. The neutrino oscillation solution to the solar neutrino problem, the missing mass problem in galaxy halos and galaxy cluster galaxy formation and clustering, and radiative neutrino decay and the cosmic ultraviolet background radiation are examined. A.R.H.

N82-22139# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.

OBSERVATIONS OF FAST, TRANSIENT GAMMA RAY PHENOMENA

Chryssa Kouveliotou Sep. 1981 207 p refs

(MPI-PAE/Extraterr-169; ISSN-0340-8922) Avail: NTIS HC A10/MF A01

The International Sun/Earth Explorer 3 (ISEE) 3 gamma-ray burst (GRB) data are analyzed for cosmic and solar events. The ISEE 3 data are compared to an inter and an extragalactic source model. The satellite data agree best with the galactic model of thermonuclear runaway initiated by carbon detonation after the accretion of matter onto a neutron star. A GRB classification based on time structure similarities is proposed: spikes, singles, doubles, and multiples. Three of the solar GRB's come from the same flaring region and have high cross correlation coefficients. This suggests that the flare phenomenon is not catastrophic for the magnetic field configurations involved. The increasing temperature in the region of trapped plasma after the electron injection causes shrinking at the rising flank of the event as event absolute maximum approaches. For homologous events, a 1 day recharging period is indicated. Events either have decay times faster than 10 sec or slower than 20 sec. No such trend is seen in rise times. Author (ESA)

99 GENERAL

N82-22140# Aerospace Medical Div., Brooks AFB, Tex.

AIR FORCE TECHNICAL OBJECTIVE DOCUMENT, AEROSPACE MEDICAL DIVISION FISCAL YEAR, 1983 Final Report

Mary A. Sanders and Thomas D. N. Douthit 1982 46 p

(AD-A109460; AMD-TR-81-1) Avail: NTIS HC A03/MF A01 CSCL 06/2

This TOD describes the planning methodology used within AMD laboratories' seven technology areas to achieve our technical goals. Specifically, efforts are directed in the biotechnology program to man's adaptability, survivability, and performance capabilities within his operational environment. This research and development of AMD's functions is accomplished as disciplinary work by teams of biomedical scientists, engineers and physical scientists within the Air Force laboratories and the industrial and academic research and development communities. GRA

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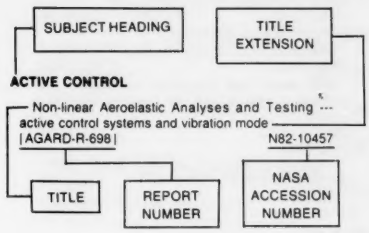
Typical Subject Index Listing



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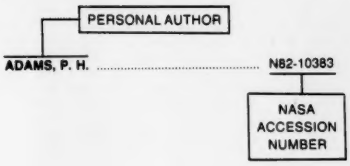

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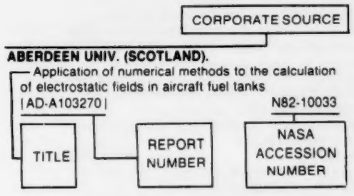

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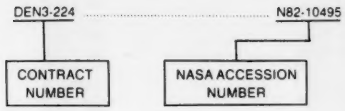

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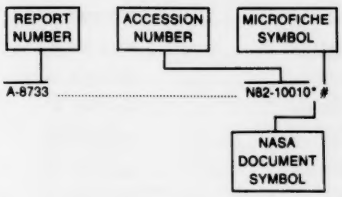

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AD-A110325 ..... N82-21613 #
AD-A110326 ..... N82-21589 #
AD-A110329 ..... N82-22083 #
AD-A110332 ..... N82-21199 #
AD-A110333 ..... N82-21200 #
AD-A110334 ..... N82-21201 #
AD-A110335 ..... N82-21176 #
AD-A110337 ..... N82-21719 #
AD-A110340 ..... N82-21516 #
AD-A110341 ..... N82-21203 #
AD-A110342 ..... N82-21808 #
AD-A110377 ..... N82-21313 #
AD-A110378 ..... N82-21992 #
AD-A110379 ..... N82-21975 #
AD-A110380 ..... N82-21342 #
AD-A110381 ..... N82-21960 #
AD-A110383 ..... N82-21930 #
AD-A110384 ..... N82-21931 #
AD-A110385 ..... N82-21482 #
AD-A110396 ..... N82-21540 #
AD-A110397 ..... N82-21802 #
AD-A110409 ..... N82-21518 #
AD-A110412 ..... N82-21966 #
AD-A110419 ..... N82-21691 #
AD-A110421 ..... N82-22003 #

AD-A110422 ..... N82-22004 #
AD-A110423 ..... N82-21537 #
AD-A110427 ..... N82-21312 #
AD-A110428 ..... N82-21480 #
AD-A110429 ..... N82-21579 #
AD-A110430 ..... N82-21202 #
AD-A110431 ..... N82-21924 #
AD-A110432 ..... N82-21534 #
AD-A110433 ..... N82-22056 #
AD-A110435 ..... N82-21273 #
AD-A110808 ..... N82-22087 #
AD-A110881 ..... N82-21317 #
AD-A111248 ..... N82-21351
AD-A111249 ..... N82-21378

AD-E850108 ..... N82-21838 #
AD-E850109 ..... N82-21839 #
AD-E850110 ..... N82-21840 #
AD-E850111 ..... N82-21841 #
AD-E850112 ..... N82-21842 #
AD-E850113 ..... N82-21843 #
AD-E850114 ..... N82-21844 #
AD-E850115 ..... N82-21845 #
AD-E850120 ..... N82-21837 #
AD-E850121 ..... N82-21836 #
AD-E850122 ..... N82-21835 #
AD-E850123 ..... N82-21834 #
AD-E850124 ..... N82-21833 #
AD-E850125 ..... N82-21832 #
AD-E850126 ..... N82-21831 #
AD-E850128 ..... N82-21830 #

AD-F050013 ..... N82-22092 #

AFAMRL-TR-80-52 ..... N82-21167 #
AFAMRL-TR-80-68 ..... N82-21883 #
AFAMRL-TR-81-79 ..... N82-21776 #
AFAMRL-TR-81-113 ..... N82-21879 #
AFAMRL-TR-81-132 ..... N82-21990 #

AFESC/ESL-TR-81-13 ..... N82-21424 #

AFGL-ERP-748 ..... N82-21807 #
AFGL-ERP-754 ..... N82-22135 #

AFGL-TR-81-0187 ..... N82-21809 #
AFGL-TR-81-0207 ..... N82-21807 #
AFGL-TR-81-0224 ..... N82-21800 #
AFGL-TR-81-0280 ..... N82-22135 #

AFHRL-TR-81-48 ..... N82-21223 #

AFIT-CI-81-66D ..... N82-22105 #

AFIT/NR-82-1T ..... N82-21273 #

AFLRL-150 ..... N82-21426 #

AFMD-81-25 ..... N82-22090 #

AFOSR-81-0142TR ..... N82-21633 #
AFOSR-81-0869TR ..... N82-21484 #
AFOSR-81-0872TR ..... N82-21974 #
AFOSR-81-0873TR ..... N82-21922 #
AFOSR-81-0875TR ..... N82-21973 #
AFOSR-81-0877TR ..... N82-21969 #
AFOSR-81-0879TR ..... N82-21971 #
AFOSR-81-0880TR ..... N82-21976 #
AFOSR-81-0881TR ..... N82-21339 #
AFOSR-81-0882TR ..... N82-21311 #
AFOSR-81-0883TR ..... N82-21970 #
AFOSR-81-0884TR ..... N82-21964 #
AFOSR-81-0885TR ..... N82-21611* #
AFOSR-81-0887TR ..... N82-21806 #
AFOSR-81-0889TR ..... N82-21582 #
AFOSR-81-0893TR ..... N82-21991 #
AFOSR-81-0895TR ..... N82-21965 #
AFOSR-81-0896TR ..... N82-22063 #
AFOSR-81-0897TR ..... N82-22032 #
AFOSR-82-0001TR ..... N82-21537 #
AFOSR-82-0002TR ..... N82-21579 #
AFOSR-82-0016TR ..... N82-21480 #
AFOSR-82-0018TR ..... N82-21518 #
AFOSR-82-0020TR ..... N82-21873 #
AFOSR-82-0023TR ..... N82-21202 #
AFOSR-82-0024TR ..... N82-22056 #
AFOSR-82-0027TR ..... N82-21534 #

AFWAL-TM-81-148-FIMM ..... N82-21541 #

AFWAL-TR-81-1163 ..... N82-21479 #
AFWAL-TR-81-1178 ..... N82-21801 #
AFWAL-TR-81-2077-VOL-1 ..... N82-21199 #
AFWAL-TR-81-2077-VOL-2 ..... N82-21200 #
AFWAL-TR-81-2077-VOL-3 ..... N82-21201 #
AFWAL-TR-81-2088 ..... N82-21563 #
AFWAL-TR-81-2107 ..... N82-21344 #
AFWAL-TR-81-2114 ..... N82-21203 #
AFWAL-TR-81-3091-VOL-PT-1 ..... N82-21181 #
AFWAL-TR-81-3091-VOL-1 ..... N82-21180 #
AFWAL-TR-81-3091-VOL-2-PT-2 ..... N82-21182 #
AFWAL-TR-81-3091-VOL-3-PT-1 ..... N82-21183 #
AFWAL-TR-81-3091-VOL-3-PT-2 ..... N82-21184 #
AFWAL-TR-81-4109 ..... N82-21342 #

AI-M-648 ..... N82-22033 #
AI-M-662 ..... N82-21170 #

AI-TR-604 ..... N82-21926 #

AIM-343 ..... N82-21881 *#

AMA-80-15 ..... I\ 2-21169* #
AMA-81-13 ..... N82-21825* #

AMD-TR-81-1 ..... N82-22140 #

AMTE(E)-R-80103 ..... N82-22096 #

AMTE(E)-TM-81101 ..... N82-22088 #

ANL-80-120 ..... N82-21319 #
ANL-81-16 ..... N82-21722 #

ANL/OEPM-80-6 ..... N82-21716 #

ANL/OTEC-BCM-019 ..... N82-21321 #

ANL/SPG-20 ..... N82-21721 #

AP-70 ..... N82-21808 #

AR-1 ..... N82-21776 #
AR-2 ..... N82-21284 #
AR-2 ..... N82-21518 #
AR-001-787 ..... N82-21213 #
AR-002-145 ..... N82-21302 #
AR-002-156 ..... N82-21417 #
AR-002-157 ..... N82-21607 #
AR-002-165-PT-1 ..... N82-21257 #
AR-002-170 ..... N82-21416 #
AR-002-218 ..... N82-21533 #
AR-002-237 ..... N82-21824 #
AR-002-240 ..... N82-22029 #
AR-002-249 ..... N82-21610 #
AR-002-253 ..... N82-21957 #
AR-002-364 ..... N82-21316 #
AR-002-368 ..... N82-21854 #
AR-002-426 ..... N82-21336 #
AR-002-583 ..... N82-21241 #
AR-002-734 ..... N82-21334 #
AR-002-735 ..... N82-21418 #
AR-002-738 ..... N82-21306 #

ARBRL-MR-03150 ..... N82-21274 #

ARBRL-TR-02383 ..... N82-21425 #
ARBRL-TR-02384 ..... N82-21160 #

ARI-TR-504 ..... N82-22083 #
ARI-TR-540 ..... N82-21880 #

ARL/AERO-REPT-154 ..... N82-21213 #

ARL/MECH-ENG-REPT-157 ..... N82-21533 #

ARL/STRUC-NOTE-466 ..... N82-21610 #

ARL/STRUC-REPT-384 ..... N82-21824 #
ARL/STRUC-REPT-385 ..... N82-21602

ARL/SYS-NOTE-76 ..... N82-21957 #

ARL/SYS-REPT-22 ..... N82-22029 #

ARLCB-TR-81045 ..... N82-22058 #

ASD-TR-81-5036 ..... N82-21176 #

AVRADCOM-TR-82-C-2 ..... N82-21260* #

AWRE-O-36/80 ..... N82-21546 #

A011/FR ..... N82-21198* #

B-TF-998 ..... N82-21240 #

BAE-INFORM-NOTE-46 ..... N82-21212 #

BAE-KGT-N-GEN-00996 ..... N82-21600 #

BAE-SON(P)-179 ..... N82-21598 #

BAE-TNAAS-84 ..... N82-21192 #

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BDX-613-2665 ..... N82-21318 #

BM-HB-2-81 ..... N82-21707 #

BM-IC-8853 ..... N82-21292 #

BM-RI-8552 ..... N82-21706 #
BM-RI-8559 ..... N82-21578 #
BM-RI-8566 ..... N82-21293 #

BMFT-FB-T-80-043-E ..... N82-21769 #

BMFT-FB-W-80-002 ..... N82-21506 #

BNL-51426 ..... N82-22008 #

BR58207 ..... N82-21493 #
BR62183 ..... N82-21566 #
BR71046 ..... N82-21163 #
BR71459 ..... N82-21499 #
BR75504 ..... N82-21161 #
BR75641 ..... N82-21490 #
BR75897 ..... N82-21789 #
BR76040 ..... N82-21164 #
BR76127 ..... N82-21489 #
BR76154 ..... N82-21913 #
BR76188 ..... N82-21530 #
BR76275 ..... N82-21227 #
BR76468 ..... N82-21946 #
BR76774 ..... N82-21899 #
BR76789 ..... N82-21325 #
BR76798 ..... N82-21546 #
BR76808 ..... N82-21565 #
BR77043 ..... N82-21492 #
BR77046 ..... N82-21346 #
BR77047 ..... N82-21816 #
BR77081 ..... N82-21592 #
BR77105 ..... N82-21564 #
BR77107 ..... N82-22096 #
BR77146 ..... N82-22007 #
BR77228 ..... N82-21916 #
BR77320 ..... N82-21884 #
BR77355 ..... N82-21617 #
BR77373 ..... N82-21949 #
BR77462 ..... N82-21265 #
BR77585 ..... N82-21948 #
BR77598 ..... N82-21697 #
BR77731 ..... N82-21438 #
BR77745 ..... N82-21817 #
BR77762 ..... N82-21228 #
BR77778 ..... N82-21190 #
BR77783 ..... N82-21952 #
BR78125 ..... N82-21903 #
BR78126 ..... N82-21902 #
BR78127 ..... N82-21900 #
BR78128 ..... N82-21500 #
BR78184 ..... N82-21567 #
BR78249 ..... N82-21901 #
BR78530 ..... N82-21216 #
BR78531 ..... N82-21601 #
BR78548 ..... N82-21165 #
BR78675 ..... N82-21327 #
BR78677 ..... N82-21885 #
BR78969 ..... N82-21630 #
BR79132 ..... N82-21953 #
BR79450 ..... N82-21918 #
BR79578 ..... N82-21255 #
BR79602 ..... N82-22088 #
BR79976 ..... N82-21267 #
BR80076 ..... N82-21256 #

BR80082 ..... N82-21217 #
BR80086 ..... N82-21244 #
BR80179 ..... N82-21886 #

BTS-FR-81-165 ..... N82-21457* #

CAEC-400-81-005 ..... N82-21448 #

CANMET-79-29 ..... N82-22020 #

CBI-F-9-79 ..... N82-21262 #

CEA-CONF-5441 ..... N82-22037 #
CEA-CONF-5472 ..... N82-22050 #

CEA-R-5053 ..... N82-22067 #
CEA-R-5078 ..... N82-21278 #
CEA-R-5079 ..... N82-22068 #

CEGB-RD/B/N-4908 ..... N82-21320 #

CEL-CR-82.007 ..... N82-21718 #
CEL-CR-82.010 ..... N82-21535 #

CEL-TN-1613 ..... N82-21719 #

CETIM-E-435-00-PT-B ..... N82-21550 #

CETIM-N-2X-00-0 ..... N82-21347 #

CETIM-1-5K-44-1 ..... N82-21629 #
CETIM-13J091 ..... N82-21628 #
CETIM-14B081 ..... N82-21498 #
CETIM-15-H-19-0-PT-4 ..... N82-21599 #

CNRS-CPT-80-P-1225 ..... N82-22070 #
CNRS-CPT-80-P-1249 ..... N82-22079 #

CONF-800950-28 ..... N82-22050 #

COO-2218-228 ..... N82-22052 #
COO-2218-229 ..... N82-22051 #

CPIA-PUB-347-VOL-2 ..... N82-21351
CPIA-PUB-347-VOL-3 ..... N82-21378

CRC-APRAC-CAPM-31-79-1-80 ..... N82-21889 #

CRIF-MC-69 ..... N82-21594 #
CRIF-MC-70 ..... N82-21446 #

CRIF-MT-138 ..... N82-21982 #
CRIF-MT-139 ..... N82-21764 #
CRIF-MT-140 ..... N82-21616 #
CRIF-MT-141 ..... N82-21324 #
CRIF-MT-142 ..... N82-21618 #
CRIF-MT-144 ..... N82-21329 #

CRIF-NT-18 ..... N82-21947 #

CRIF-PL-15 ..... N82-21349 #

CRREL-SR-81-30 ..... N82-21590 #

CSIR-ME-1674 ..... N82-21191 #

CSIR-TRANS-1581 ..... N82-21310 #
CSIR-TRANS-1582 ..... N82-21271 #
CSIR-TRANS-1583 ..... N82-21799 #

CSTR-437 ..... N82-21912 #
CSTR-442 ..... N82-21911 #
CSTR-445 ..... N82-22094 #

CTH-MATH-1981-05 ..... N82-21988 #

CW-WR-76-020.74A ..... N82-21591 #

DDA-EDR-10363-VOL-1 ..... N82-21199 #
DDA-EDR-10363-VOL-2 ..... N82-21200 #
DDA-EDR-10363-VOL-3 ..... N82-21201 #

DEL/CA/269 ..... N82-21915 #

DELET-TR-78-3015-4 ..... N82-21517 #
DELET-TR-79-0283-F ..... N82-21512 #
DELET-TR-81-18 ..... N82-22059 #

DE81-03093 ..... N82-21345* #
DE81-028326 ..... N82-21874 #
DE81-029813 ..... N82-21875 #
DE81-029977 ..... N82-22071 #
DE81-030004 ..... N82-21780 #
DE81-030059 ..... N82-21591 #
DE81-030331 ..... N82-22012 #
DE81-030873 ..... N82-21544 #
DE81-030965 ..... N82-21279 #
DE81-030978 ..... N82-21749 #
DE81-031987 ..... N82-21760 #
DE81-700654 ..... N82-21299 #
DE82-000092 ..... N82-21746 #
DE82-000127 ..... N82-21761 #
DE82-000143 ..... N82-21427 #
DE82-000225 ..... N82-22072 #
DE82-000228 ..... N82-22073 #
DE82-000302 ..... N82-22019 #
DE82-000398 ..... N82-22069 #
DE82-000633 ..... N82-21753 #
DE82-000653 ..... N82-21442 #
DE82-000738 ..... N82-21730 #
DE82-000829 ..... N82-21740 #
DE82-000833 ..... N82-21542 #
DE82-000892 ..... N82-21281 #
DE82-001038 ..... N82-21432 #
DE82-001042 ..... N82-21434 #
DE82-001101 ..... N82-21747 #
DE82-001415 ..... N82-21742 #
DE82-001416 ..... N82-21739 #
DE82-001544 ..... N82-21744 #
DE82-001592 ..... N82-21784 #
DE82-001606 ..... N82-21720 #
DE82-001612 ..... N82-21758 #
DE82-001626 ..... N82-21277 #
DE82-001628 ..... N82-21743 #
DE82-001657 ..... N82-21738 #
DE82-001661 ..... N82-21280 #
DE82-001663 ..... N82-21733 #
DE82-001669 ..... N82-21782 #
DE82-001672 ..... N82-21783 #
DE82-001688 ..... N82-21781 #
DE82-001694 ..... N82-21725 #
DE82-001796 ..... N82-21748 #
DE82-001827 ..... N82-21724 #
DE82-001866 ..... N82-21736 #
DE82-001922 ..... N82-21735 #
DE82-001929 ..... N82-21436 #
DE82-001933 ..... N82-21741 #
DE82-001940 ..... N82-21694 #
DE82-001978 ..... N82-21737 #
DE82-002097 ..... N82-21729 #
DE82-002108 ..... N82-21732 #
DE82-002134 ..... N82-21693 #
DE82-002157 ..... N82-21734 #
DE82-002410 ..... N82-21429 #
DE82-002412 ..... N82-21428 #
DE82-002433 ..... N82-21431 #
DE82-002462 ..... N82-21759 #
DE82-002530 ..... N82-21437 #
DE82-002570 ..... N82-21435 #
DE82-002616 ..... N82-21430 #
DE82-002698 ..... N82-21751 #
DE82-002711 ..... N82-22051 #
DE82-002714 ..... N82-22052 #
DE82-002716 ..... N82-21283 #
DE82-002755 ..... N82-21750 #
DE82-002757 ..... N82-22010 #
DE82-002816 ..... N82-21225 #
DE82-002840 ..... N82-21731 #
DE82-002924 ..... N82-22011 #
DE82-002996 ..... N82-21728 #
DE82-003000 ..... N82-21762 #
DE82-003007 ..... N82-21722 #
DE82-003035 ..... N82-21284 #
DE82-003099 ..... N82-21318 #
DE82-003207 ..... N82-21723 #
DE82-003230 ..... N82-21756* #
DE82-003251 ..... N82-21319 #
DE82-003259 ..... N82-22008 #
DE82-003289 ..... N82-21752 #
DE82-003338 ..... N82-21754 #
DE82-003546 ..... N82-21726 #
DE82-003562 ..... N82-22009 #
DE82-003633 ..... N82-21755 #
DE82-003663 ..... N82-21757 #
DE82-003919 ..... N82-21321 #
DE82-003922 ..... N82-21745 #
DE82-003942 ..... N82-21810 #
DE82-004045 ..... N82-21721 #
DE82-004257 ..... N82-21282 #
DE82-004376 ..... N82-21443 #
DE82-004692 ..... N82-22018 #
DE82-004726 ..... N82-21441 #
DE82-900339 ..... N82-21763 #
DE82-900386 ..... N82-21695 #
DE82-900582 ..... N82-21433 #
DE82-900874 ..... N82-21727 #
DE82-900887 ..... N82-21785 #
DE82-900968 ..... N82-21786 #

DGLR-80-028 ..... N82-21162 #

DHHS/PUB/FDA-81-8179 ..... N82-21574 #

DNA-5672F ..... N82-21239 #
DNA-5851F ..... N82-21804 #

DOE/AF-92017/T1 ..... N82-21427 #

DOE/CS-30367/6 ..... N82-21729 #
DOE/CS-31217/T7 ..... N82-21762 #

DOE/EIA-0214/79-S ..... N82-21728 #

DOE/ER-02753/147 ..... N82-22010 #
DOE/ER-02887/3 ..... N82-22011 #
DOE/ER-02894/2 ..... N82-22009 #
DOE/ER-04310/22 ..... N82-21874 #
DOE/ER-10371/3 ..... N82-22012 #
DOE/ER-10443/3 ..... N82-22069 #
DOE/ER-10510/T3 ..... N82-21283 #
DOE/ER-10687/T1 ..... N82-21544 #
DOE/ER-30008/T1 ..... N82-21730 #

DOE/ET-15440/4 ..... N82-21732 #
DOE/ET-17091/T3 ..... N82-21780 #
DOE/ET-20279/T11 ..... N82-21442 #
DOE/ET-20279/108 ..... N82-21731 #
DOE/ET-20279/141 ..... N82-21734 #
DOE/ET-20279/143 ..... N82-21443 #
DOE/ET-20279/151 ..... N82-21225 #
DOE/ET-20279/163 ..... N82-21441 #
DOE/ET-23003/4 ..... N82-21726 #
DOE/ET-23033/T4 ..... N82-22071 #
DOE/ET-37116/T4 ..... N82-21756* #
DOE/ET-52040/T4 ..... N82-22052 #
DOE/ET-52040/T5 ..... N82-22051 #

DOE/EV-10327/T1 ..... N82-21875 #

DOE/ID-12079-41 ..... N82-21810 #

DOE/IR-10295/T1 ..... N82-21436 #

DOE/JPL-1060-44 ..... N82-21345* #

DOE/LC-10747/T4 ..... N82-21693 #

DOE/MC-16220/T1 ..... N82-21723 #

DOE/NASA/150-81/7 ..... N82-21709* #
DOE/NASA/150-81/7 ..... N82-21711* #
DOE/NASA/0161-9A ..... N82-21713* #
DOE/NASA/20320-36 ..... N82-21714* #
DOE/NASA/20370-22 ..... N82-21710* #
DOE/NASA/51040-30 ..... N82-21193* #
DOE/NASA/51040-32 ..... N82-21712* #

DOE/NV-10061/9 ..... N82-22018 #

DOE/PC-30139/T2 ..... N82-21279 #
DOE/PC-30228/T2 ..... N82-21281 #
DOE/PC-30298/T4 ..... N82-21282 #
DOE/PC-40005/5 ..... N82-21437 #
DOE/PC-40272/T2 ..... N82-21280 #

DOE/RA-20218/1 ..... N82-21435 #
DOE/RA-50076/T5 ..... N82-21761 #
DOE/RA-50239/T1 ..... N82-21759 #
DOE/RA-50321/T1 ..... N82-21431 #
DOE/RA-50322/T1-VOL-1 ..... N82-21428 #
DOE/RA-50322/T1-VOL-2 ..... N82-21429 #
DOE/RA-50361/T1 ..... N82-21430 #

DOE/R5-10230/2 ..... N82-21757 #

DOE/SF-11438/T1-VOL-1 ..... N82-21733 #
DOE/SF-11494/T1-APP-A-H ..... N82-21736 #
DOE/SF-11494/T1-VOL-1 ..... N82-21735 #

DOE/TIC-11493 ..... N82-21760 #

DOE/TIC-2001038-VOL-1 ..... N82-21432 #

DOT/FAA-CT-82-16-VOL-1 ..... N82-21173 #
DOT/FAA-CT-82-16-VOL-2 ..... N82-21174 #

DP-81-157-1 ..... N82-22019 #

DPD-609 ..... N82-22016* #
DPD-609 ..... N82-22017* #

DR-4 ..... N82-22016* #
DR-4 ..... N82-22017* #

DRES-MEMO-1021 ..... N82-21536 #

DRIC-T-6120 ..... N82-21789 #
DRIC-T-6220 ..... N82-21265 #
DRIC-T-6253 ..... N82-21899 #
DRIC-T-6261 ..... N82-21325 #
DRIC-T-6275 ..... N82-21630 #
DRIC-T-6277 ..... N82-21592 #
DRIC-T-6292 ..... N82-21885 #
DRIC-T-6313 ..... N82-21817 #
DRIC-T-6344 ..... N82-21327 #
DRIC-T-6433 ..... N82-21886 #

D180-26777-1 ..... N82-22016* #
D180-26777-2 ..... N82-22017* #
D180-26988-1 ..... N82-21246* #

E-116 ..... N82-21260* #
E-678 ..... N82-21300* #
E-713 ..... N82-21298* #
E-899 ..... N82-21193* #
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